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In the growth of THE ELECTRICAL WORLD in circulation, size and general improvement, the value of its columns for reaching those engaged in electrical pursuits or interested in electrical matters has not failed to be appreciated by advertisers. Readers will find it to their advantage to keep their eyes on the advertising as well as the reading columns. The following are the new advertisements in this issue:

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Vol. IX. NEW YORK, APRIL 23, 1887. No. 17.

CARBONS at five dollars a thousand are not quite the drug in the market they once were.

WE publish this week an interesting article on the subject of varnishing incandescent lights. The process is evidently one for which there is use.

THE soil of Mexico has not so far shown itself to be specially suited to the rapid growth of telephonic plants. Last year little money, it appears, was made out of the business there, but now, with a scaling down of capitalization and a consolidation of interests, better times are expected.

ONCE again the rumors revive of an advance in cable rates, and Western Union stock is quick to move in sympathy with the better times thus heralded. Perhaps there is nothing in the rumors, but there ought to be. Desperate fighting at twelve cents a word may be magnificent, but it is not business.

OUR telephonic readers have felt quite a lively interest with regard to the new writing telegraph system lately tried in Pittsburgh and Rochester. We are able to gratify their natural curiosity and give on another page an illustrated description of the apparatus. The telephone will, we think, still be greatly in demand.

THE plan of an underground electric railway, presented by Col. R. R. Hazard before the Rapid Transit Commission of this city, is a decidedly ingenious one, and one which, if adopted, will not only reduce the cost of constructing, but also the expense of operating such a road. By suspending the cars very low and near to the ground the depth of the excavation required is greatly reduced, which also lessens the interference with existing pipes of all kinds.

ELECTRICIANS of reputation are as a rule somewhat slow to advance unorthodox opinions as to the nature of electricity. It will be seen, however, that Mr. Carl Hering, in a communication on another page, propounds one or two questions on the subject in a manner that indicates him to be not altogether opposed to what may be called the material theory of electricity. His letter is well worth reading.

AN important step has been proposed in Massachusetts respecting electric light companies. It is desired to put them under the supervision of the State Gas Commission, and to give the Commission the power to decide whether, after an electric light company has been established in any place, another can come in. This latter power, if granted and if judiciously exercised, might be highly advantageous to the business.

THE subject of a Technical University is attracting attention in London, where an important meeting was lately held to consider what could be done. Professor Ayrton made an address, presenting eloquently some very cogent reasons why such a university should be established. It is to be hoped the scheme now maturing will not be dropped. Living science should have its seat of learning, as well as dead languages.

THE Glasgow, Scotland, Underground Railway is to be lit permanently by electricity, the current being taken up by a "trailing collector." About $25,000 is to be spent in equipment. This is a step in the right direction, but only a step. That "trailing collector" will serve to run the whole service of trains by electricity, as well as light them, and will dispense with the use of coal and steam just where they are most obnoxious.

NEW YORK was promised a notable exhibition of activity in subway matters when the frost came out of the ground. It is true that winter still has its grip on this part of the world, but in view of the fact that May will be here in a week, it seems likely that those who expected the poles to go "on the run," and to have clear streets by the Fall, will be slightly disappointed. The poles are longer lived than the Commission appointed to remove them.

AT a recent meeting of Colonial representatives in London, called the Colonial Conference, the fact was brought out that the submarine telegraph systems of the world embrace 107,000 miles of cable, costing something like $185,000,000, and that all except 7,000 miles is under British control. Such a showing ought to be very grateful to British pride, but is hardly regarded as satisfactory, for one of the subjects of discussion by the conference was the extension of existing cable systems and the construction of new. The subject of lower and unified cable rates was also wisely borne in mind.

THE introduction of the telephone has, strange to say, called back to life the fac-simile telegraph, more than one inventor having sought by improving upon old methods to establish rapid and general communication by means of telegraphic writing machines. Most of these have hitherto confined themselves to the chemical method first brought out by Bain; but one hit upon the ingenious idea of utilizing the very principle which has made the telephone a success, to cause the reproduction of written characters. The manner in which this is accomplished is described on another page, and presents an interesting example of how one principle may be applied to two distinct purposes.

THE use of the electric light in the furtherance and rapid completion of great engineering works becomes more frequent. Some of the heaviest pieces of railroad construction are now being greatly expedited by the employment of arc lights which render the scene as brilliant as day. Thus on the Manitoba road tracklaying will go on at night as well as by day; and as noted this week, in the new Stampede Tunnel the arc is found extremely serviceable. Another exemplification of the help that electricity thus affords is to be seen here in New York, in the vast excavations now being made for the aqueduct. Electric lights are not only indispensable in these engineering operations, but even on the bare basis of calculation, that time is money, a very appreciable economy is effected by them.

SOME weeks ago we drew attention on this page to the fact that no concise term existed in English to designate the space between the iron of the pole pieces and that of the armature in the dynamo. This hint has been taken up by a number of our readers who have essayed to fill the void existing in the electrical vocabulary. Among the suggestions sent in we find the following: "Windage," "gap," "interstice," "swim," "diamagnetic space," "passage," "kinetic field," "interfield" and "annulus." In contemplating this array of terms we take rather kindly to the last, which is certainly among the best of those proposed. What is wanted, however, is a word or term which, while short, still expresses the true nature of the space to be defined. The word "annulus" merely indicates its form without giving a clue to its nature, and though good in the first respect it is deficient in the latter. The French term *entre-fer* is a good one, but is awkward to translate without circumlocution. We still think that a better term than any of those yet suggested can be found. We might, however, mention that the term "inter-ironical space" has already been pre-empted by a well-known electrician living not a hundred miles from Boston.

MR. J. ZACHARIAS, in an interesting communication to the London *Electrical Review*, gives an account of the extensive use made of electric lights in the illuminations at Berlin during the festivities in honor of the Emperor. The electricians connected with the various central stations prepared some striking special effects for their own buildings as well as for customers. One of the Edison stations, for instance, had about 1,000 ten-candle lights on its front and the windows were bordered with colored lamps. The French and German cathedrals had on both their towers 24 arc lamps, each of 25 ampères, and the German Edison Company supplied 5,000 special incandescent lamp fittings, etc. Mr. Zacharias naturally remarks: "The gigantic advantages which the electric light has effected, slowly but safely, in the capital of the German Empire, was brought clearly before the world by these surprising facts. If the gas-works still maintained that the application of the electric light in Berlin was too trifling to make itself felt as a competitor, this view will no longer be found in harmony with actual facts." Mr. Zacharias quotes figures as to the growth of the stations, and says that probably the time is not far distant when the number of incandescents in Berlin will be greater than that in New York. That may be, though we doubt it. The incandescent light is being adopted more rapidly in New York to-day than we ever knew it to be before, and some of the plans, of more than one system, now under serious consideration, and very soon to be carried out, would, we think, rather stagger Mr. Zacharias with their immensity.

THE origin of earthquakes has been the subject of much speculation and many theories, not a few of which have included the factor of electricity as a prominent cause. Recently again Ch. Naudin, in *Comptes Rendus*, suggests that earthquakes may be due to the greater or less resistance which certain parts of the earth's crust present to the electric currents generated within the globe. He points out further, or asserts, that the countries visited by earthquakes are devoid of forests, which would favor the escape of the electricity. In a somewhat similar manner Mr. George O'Brien, writing in the *Mining Journal*, distinguishes most of the earthquakes that occur on the western coast of South America as arising from the local action and volcanic exhalations in the Andes causing electrical currents down the valleys from east to west, and under the "made ground," which is derived from constant wearing down of the mountains. "The electric current traveling on the firm rock, conducted by the moisture and water lying upon it, and thus in contact with the material possessing for it the greatest powers of conductivity, and from such fulcrum and firm basis the current shakes the made ground above it, with buildings thereon, the electric fluid then escaping into the atmosphere, animating all nature and eventually causing when in excess thunder and lightning." The latter "theory" is somewhat involved, but the idea embodied in both those cited is, we judge, that the variable electrical tension in different parts of the earth's crust creates a condition which, under certain circumstances, causes a stress sufficient to overcome the normal state of equilibrium. As to the point about the absence of forest, that seems open to question. The West Indian Islands and South American regions subject to earthquake are generally, and in some cases superabundantly provided with trees.

NEW BOOKS.

Lives of the Electricians.—Tyndall, Wheatstone and Morse. (First Series.) By W. T. Jeans. New York: D. Van Nostrand; London: Whittaker & Co. 1887. Pp. 327, 5 × 7¼. Price, $2.25, cloth.

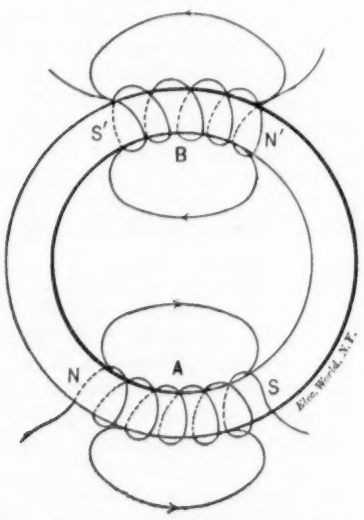
Nothing would be more welcome than a complete series of lives of the leading electricians. The information regarding the careers and characteristics of those who have advanced the science or application of electricity is generally far to seek, and scant when found, except in the case of a few, such as Faraday, Franklin, Davy and Morse. This book is an effort in the right direction, but will hardly be regarded as satisfactory. Probably the series will improve as it grows; at present it is not adequate in execution to the importance of the task. It is too modest, for each of the lives might well fill a large volume, and be intensely interesting as well as instructive, from cover to cover. Besides, biographies without portraits are always incomplete. However, one must not complain, but be glad that even in this form some account is accessible of lives that have made so deep an impress on their time. It is not unlikely that the life of Tyndall, which, as here well set forth, presents many points of comparison and similarity with that of Herbert Spencer, will be the most attractive of the three, especially at a time when the withdrawal of Prof. Tyndall from the Royal Institution marks the close of one of the most fruitful periods of his public work. It is to be hoped that the renewal of health will restore to science one who, in the loftiest spirit of self-devotion, has done so much for it and for mankind, and will furnish new material for the skill of Mr. Jeans to elaborate in a biography worthy its subject.

Pole Pieces and Dynamo Construction.

BY TOWNSEND WOLCOTT.

I observe in your issue of April 9 an article by Mr. R. S. Dobbie, in which my paper published on March 5 is criticised.

As the criticism seems to have been penned in a spirit of



Pole Pieces and Dynamo Construction.

fairness and truthseeking, I shall endeavor to make my position clear as far as possible. My paper, which was hastily prepared, and published without the discussion, is not very explicit.

In the first place, I use the principle of the composition and resolution of forces (as mentioned in a previous paper, Electrical World, Dec. 4, 1886), which seems to be somewhat neglected by practical electricians. The Jamin magnet approximates a closed solenoid, and is, therefore, practically devoid of external field: but does this represent a real gain?

Suppose we have a complete ring of iron, on which is a single coil *A* (see figure). The winding not being uniform over the whole ring, there will be poles as at *N S*, and an external field, a single line of force being represented on each side of the core. Now put in place an equal coil at *B*. This will produce an exactly similar field, and poles *N' S'*. The field being partially superposed on that of *A*, in a contrary direction, partially neutralizes it, and if more coils are put on until the ring is entirely and uniformly covered, the external field entirely disappears.

Now, my remark about the value of the yoke was stimulated by this idea. It has occurred several times that an electrician has examined the rear end of his dynamo, and finding considerable external field, has concluded that the yoke was too light, and has clapped on some more iron. Suppose we apply this reasoning to the above case. When there is one coil on the ring, there is an external field, and consequently the ring is too light to carry the magnetic current from one coil; but when the ring is completely covered with coils, there is no external field, and consequently the ring is plenty heavy enough to carry the magnetic current from a number of coils; hence a part (and a very small part at that) of a thing is considerably greater than the whole! I think that Mr. Dobbie will be able to consign this proposition to the limbo of nonsense, without doing the same with the work of that list of eminent electricians which he has arrayed against me.

Returning to the ring with the coil *A*, suppose the coil *B* to be slipped around so as to cover *A*. Now, however good a conductor of magnetism the ring may be, a long portion cannot have less resistance than a short one, and *B* will therefore produce more magnetism in the *lower portion* of the ring than it did in its former position; but its external field will be added to that of *A*, instead of neutralizing it as before.

But is this external field really a detriment? Suppose the lower portion of the ring cut away sufficiently to admit an armature. We now have a dynamo with the wire all crowded up around the poles, and that terrible bugbear, an external field. What shall we do with this external field? Shall we make it go down to the armature? No, it is in the wrong direction and would only neutralize the

Fig. 1.—New District Telegraph Call Box.

armature portion. Then why does it not go and hide itself in the upper portion of the ring? Not from any innate depravity or "pure cussedness," but simply because the conductivity of a good conductor (the iron), plus that of a poor one (the air), is greater than that of the good one alone.

As to ignoring the concentrating influence of iron, if this means the increase of magnetism due to the introduction of a core into a coil, I certainly do not ignore it. I think, on the other hand, that the word "concentration" is inadequate to express the fact where the force is actually increased. Nor do I indorse the Thomson-Houston machine except in that one particular, that the winding of itself producing a field in the right place, the iron has nothing to do but to increase the field, and does not, in addition, have to lead it around by Robin Hood's barn to get it in the right place.

A New District Telegraph Call Box.

With the object of simplifying its construction and making the district messenger box accessible for inspection at all times, Mr. George S. Nickum, of Dayton, O., has recently designed the form shown in the accompanying illustrations. The box, shown closed in Fig. 1, has upon its face a circular dial plate, with the various calls to the number of ten stamped upon it. In the centre of the dial is a revolving knob with an index arrow upon it, resembling very much the knob on a combination safe lock. At the left of the dial is the winding lever by which the mechanism is set when a call is to be sent in. In the centre of the knob is a push-button which releases the mechan-

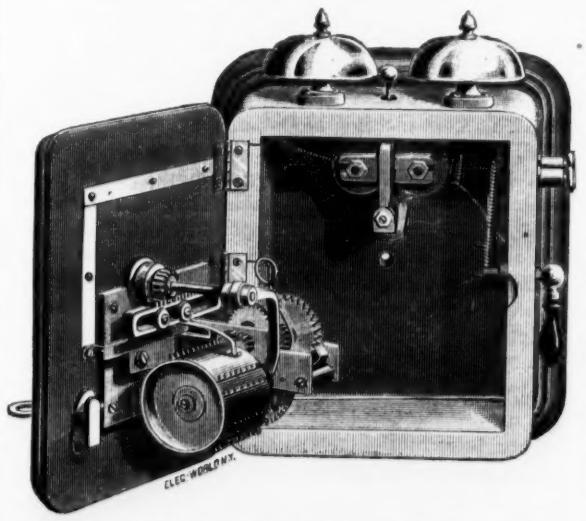


Fig. 2.—New District Telegraph Call Box.

ism. Thus, when a call is to be sent in, the arrow on the knob is set to correspond to the desired call, the lever is pulled down, and the button is pushed, when the call is sent. In this way any mistakes or false calls are prevented, as the call is not sent in before the sender has a chance to rectify an error in the placing of the index arrow.

In addition, the box is provided with a magneto return signal, which is put into circuit by pushing back the small handle shown at the right of the box. Normally, the bell is cut out of circuit, but as soon as a call has been sent in, the handle is pressed back, and the circuit then being through the bell, the central office can send in a signal that the call has been correctly received, or order it repeated if need be.

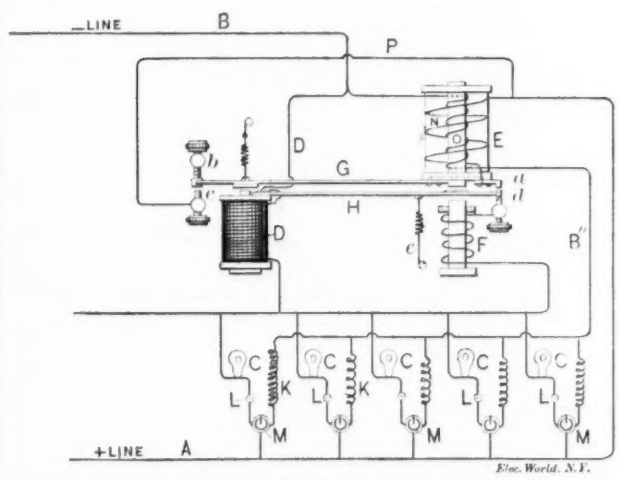
The interior mechanism is shown in Fig. 2. It consists simply of a clock-work geared to the signal cylinder, so that the latter makes one complete revolution by the throw of the winding lever. The signal cylinder is provided with two sets of projecting pins. One of these sets of ten rows has pins ranging in number from 1 to 10 while the other set is uniform, the number character indicating the number of the box. Over these pins, as they revolve, there passes a spring brush which, when a pin strikes it, is lifted out of contact with another spring directly below it, and thus the circuit is broken. The two springs are carried on a rack which gears with a wheel connected to the knob on the outside. By revolving the outer knob, the rack and springs are moved so that the latter come over a row of pins corresponding to the setting of the knob. The pins are so arranged that the call desired and then the number of the box are transmitted.

The box is very neatly gotten up and is evidently simple in construction to accomplish such results.

An Automatic Cut-Out and Restorer for Incandescent Lamps on Arc Circuits.

In the usual method of operating incandescent lamps on arc light circuits, each lamp is accompanied by an equivalent resistance, and when any lamp is extinguished, either by accident or design, it is replaced by its appropriate resistance, so that the proper balance and working conditions of the circuits are preserved. In this system there is evidently no economy in turning off one or more lamps of a group, because an equivalent is introduced in its place; but when all the lamps of a given group are turned off it is evidently desirable to cut out the group of resistances until one or more of the lamps in the group be again lighted.

In order to avoid the difficulty just pointed out, Mr. J. A. Powers, of Troy, N. Y., has recently designed an apparatus for automatically performing the two operations of cutting out or short-circuiting the group when all the lamps therein are extingished, and of bringing the group back into the circuit simultaneously with the reclosing of the circuit through any one of the lamps. The



Cut-Out for Incandescents on Arc Circuits.

manner in which this is effected is shown in the accompanying illustration. In addition to the usual arrangement of circuits, there are included three electro-magnets *D E F*. An armature and contact lever *G* is acted upon by the magnet *E*, and a similar lever *H* is acted upon by either the magnet *E* alone, or by the magnets *E* and *F*. The positive wire of the main line *A* is connected to the outer one of the coils *N O* which surround the coil of the magnet *E*. This coil terminates in an insulated contact stop *a*, and is connected electrically with the lever *G*, which vibrates between an insulated back-stop *b*, and a contact stop *c*, to which a branch *P* from the wire *A* is connected. The negative wire *B* is divided into the two branches *B' B''*. The branch *B'* includes the lever *H* and the magnet *F*, being completed by the contact of the lever *H* with the contact stop *d*. The lamp-circuits are made between this branch and the main wire *A*. A shunt of high resistance, including the magnet *D*, is formed around the break at contact *d*. The other branch *B'* of the wire *B* includes the inner coil of the magnet *E*, and between this branch and the wire *A* the resistance circuits corresponding to the lamp circuits are placed.

The operation of the system is as follows: While all the lamps *C* are burning, the current passes through the magnet *F*, stop *d*, and letter *H* and a very small amount through magnet *D*. The magnet *F* is used to insure perfect contact between the lever *H* and stop *d*, and it will be seen that the stronger the current the better this contact will be. This magnet is not indispensable, however, as a simple spring, as *e*, might be used when properly adjusted. If one lamp be now turned off by its switch, the automatic cut out immediately closes its appropriate parallel path, including a resistance, and transfers its proportion of current to the branch *B''*. No further change is produced in the apparatus by this act, nor by the subsequent removal of lamps and substitution of resistances, except that the magnet *E*, which, with its appurtenances, may be regarded as the final cut-out energized by its inner coil, increases in attractive force; but the armature lever

is so adjusted by a spring H that it is not moved by the magnet E until all the lamps have been removed from the circuit. When that is done, however, the lever H is drawn up into contact with the stop a, and a new path of low resistance is thus established from wire A through the outer coil N of magnet E, the stop a and lever H to line-wire B, which short-circuits the group of lamps and resistances.

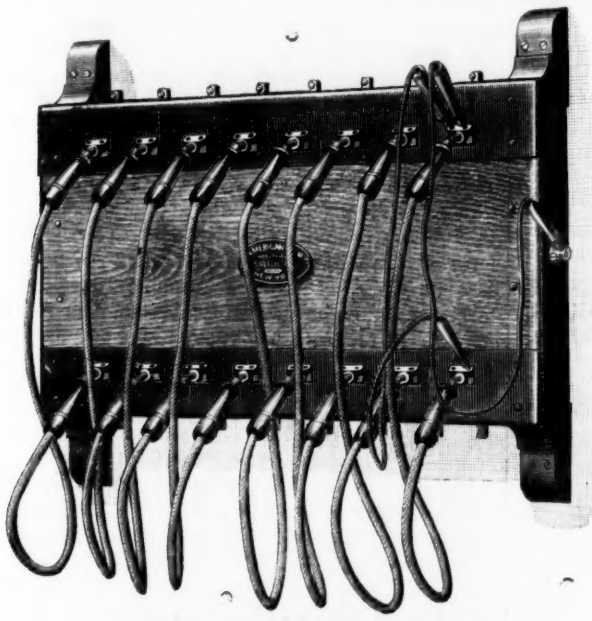


FIG. 4.—NEW SWITCH BOARD.

The current through this path maintains the lever H in contact with stop a by energizing the magnet E, while the lever G remains still unaffected by reason of the interruption of the circuit through magnet D.

If, under these conditions, a lamp be turned on or brought into circuit, a path is established through the "restoring magnet" D. The resistance of the circuit through coil N is such as to divert sufficient current through the magnet D to cause it to draw down the lever G. Mr. Powers has found that a comparatively low resistance will suffice to divert the requisite current, and ordinarily secures this resistance by making the coil N of about one-half ohm. When the armature G is brought into contact with the stop c, the coil N is short-circuited and loses its power, whereupon the armature-lever H is instantly brought down into contact with stop d, short-circuiting the magnet D, and in other respects establishing the conditions previously described.

Plebeian Luxuries Afloat.—The owners of the Hamburg-American Line are to have electric lights in the steerage of the "Bohemia" and "Moravia."

Recent Improvements in the American System of Electric Lighting.

During the last few months the system of electric lighting designed by Mr. James J. Wood, and built by the American Electric Manufacturing Company, has been improved in quite a number of respects by the inventor; not only the dynamo, but the lamp and other fittings have received careful attention.

The new machine shown in the engraving, Fig. 1, while resembling the older form in general, nevertheless contains several novel and interesting features It will be noticed that the dash-pot formerly employed in connection with the automatic regulator is now dispensed with, as it has been found to be unnecessary with the new arrangement for non-sparking, to be described presently.

The regulation of the Wood machine, as is well known, is accomplished by the shifting of the brushes so as to give constant current. This shifting is effected by a solenoid attracting or releasing a core, which motion brings corresponding friction wheels into operation that shift the brushes accordingly.

In order to avoid sparking upon a change in the load, before the brushes arrive at their new position, Mr. Wood has adopted the plan of using what may be called a "double brush." This is shown in Fig. 2, which exhibits an end view of the commutator with the brushes in the position of maximum and minimum load. The "double brush," as will be seen, has two contacts, between which a certain number of sections of the armature coils is included. All these coils are, therefore, cut out of the circuit, and by this means sparking is entirely avoided. We have seen a 25-light American machine in operation with this arrangement, which, when the terminals were short-circuited, corrected itself to the new adjustment with but a trace of a spark, the turning out of single lights in rapid succession, leaving only one lamp in circuit, causing no sparking whatever.

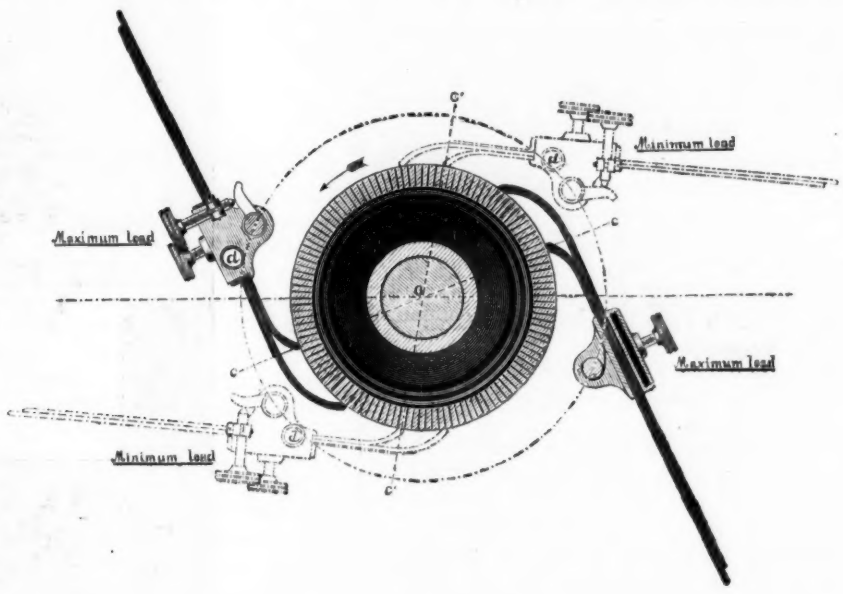


FIG. 2.—WOOD'S NON SPARKING BRUSH ARRANGEMENT.

The method of connecting the coils in the machine is shown in the isometric perspective, Fig. 3. In the old style of connecting the field magnet coils, the circuit ran from one terminal through the limbs of one set of magnets out to line and back again through the other set of magnet coils to the other terminal. Thus almost the full potential of the machine existed between one terminal and the magnet coils connected to the other terminal, and if, as might occur, the magnet coil be grounded at the machine, or a slight leak develop between the coils and the iron, a person touching one terminal and the frame of the machine would be apt to get a decided shock.

In the new method of connecting this is entirely avoided by running the circuit from one terminal continuously through all the magnet coils and then out to line and back to the other terminal. In this way the difference of potential between the terminal and the magnet coils can only be very slight, being due only to the resistance in the latter.

The armature of the machine is wound with wire insu-

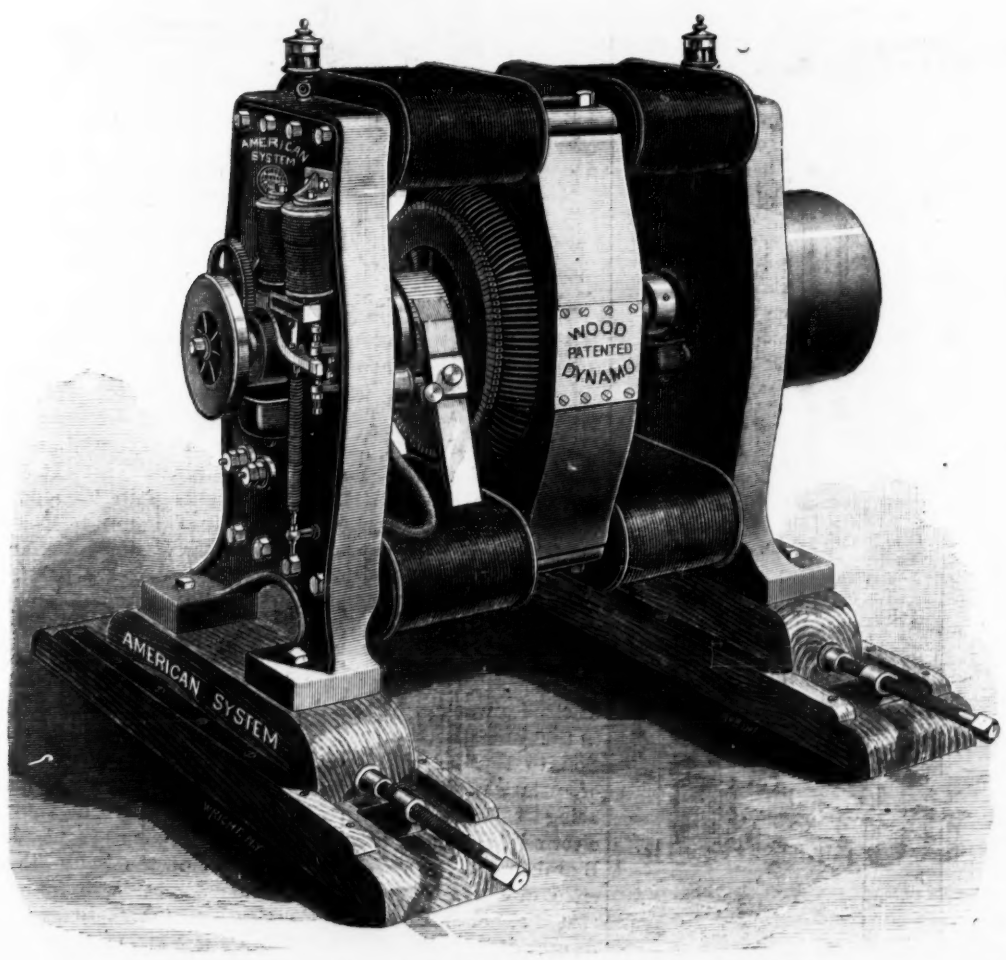


FIG .1.—IMPROVED AMERICAN (WOOD) DYNAMO.

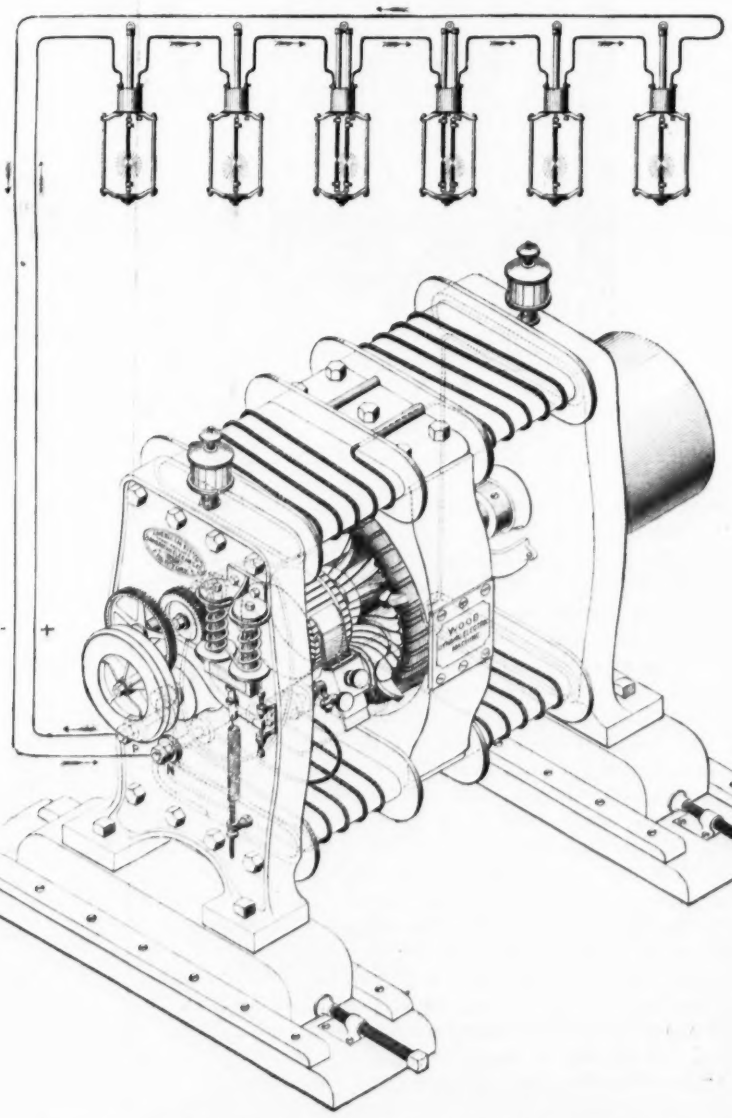


FIG. 3.—DIAGRAM OF CIRCUITS. WOOD DYNAMO.

lated with "okonite," which Mr. Wood states will maintain insulation and remain intact even when the coils are heated almost to redness by the current.

In testing the various parts of the machine during construction, an ingenious and rapid process for testing the insulation between the commutator bars has been devised by Mr. Wood. For that purpose a small machine giving one ampère at 200 volts is employed. An operator holding a pair of metal tipped handles connected to the terminals of this machine presses the outer ends of two adjacent commutator bars together so as to short circuit the machine. He then allows them to spring apart rapidly, the arc formed being immediately blown out by an air blast. The induced current of high E. M. F. caused by the breaking of the circuit evidently has no other path left than through the insulation between the bars. If this is perfect, it does not permit the passage of a spark ; but any slight imperfection allows a spark to pass and an arc is formed between the bars. Thus the weak spots in the commutator are detected and remedied before the commutator goes into the machine.

The new lamp designed by Mr. Wood also presents several novel features, by which arcing is entirely prevented under all conditions.

The new switch-board and lightning arrester employed by him is shown in Fig. 4. Locking plugs are employed which cannot fall or be pulled out until the handle is turned sidewise through an angle of 90 degrees. The plugs are provided each with a pair of sockets at the top, into which pin plugs can be inserted as shown to the right in the engraving. By this means connection can be made between any two circuits without breaking either with the main plug. When once the connection is established, however, the main plug can be shifted and the auxiliary plugs removed. The latter are also employed for testing the circuits, the "ground" connection being shown at the right end of the board.

Where circuits enter buildings, the fire underwriters'

Fig. 5.—American Wood Cut-Out.

regulations require a cut-out to be placed in the circuit. The one designed by Mr. Wood for the American system is shown in Fig. 5 ; the interior being seen in Fig. 6. The cut-out breaks the circuit at two points, and, by the construction, the break is a rapid one, however slow the movement of the hooked rod which effects it may be. In this way all arcing is prevented.

The lamp post and hanger which have been lately added to the other improvements are shown in Figs. 7 and 8. In the former a bracket supporting three insulators is employed. The linemen, in order not to be delayed with connecting up the lamp, fasten the outgoing wire directly to the two upper insulators, and continue on. When the lamp, later on, is in position, the wires leading to the lamp are connected to the line and the wire bridging the space between the insulators is then cut, so that the circuit is through the lamp. Thus time and annoyance are saved. Where the line returns over the same way as the outgoing wire, the third insulator is employed ; but where this is not the case, the insulator may be removed, it being detachable for that purpose.

The lamp hanger shown in Fig. 8 is constructed to prevent arcing, due to the swinging of the lamp. For this purpose springs are placed within the eyes supporting the lamp ; they bear down upon the hooks attached to the lamp, and thus make good contact. The cut-out is also constructed to prevent the giving of a shock to the lamp trimmer. For this purpose, the cross-bar connecting the two contact breakers is made of insulating material ; a shifting-bar, pivoted in the rear, passes through a slot in the cross-bar and permits of the cutting in or out of the lamp.

Howell's Carbon Cutting Machine.

What is likely to prove an invention of great practical value and economy in the use of battery cells is now on its trial at the works of Mr. T. J. Howell, Mile End, London. This is, as described by the London *Electrician*, a new and speedy process of reducing retort carbon to the dimensions

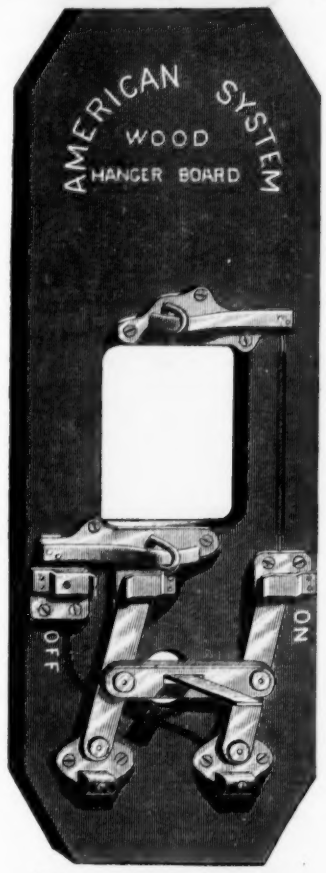


Fig. 8.—Lamp Hanger.

devised a machine which obviates to a great extent both these drawbacks. The irregular blocks of carbon are first placed in a wooden frame and embedded in layers of

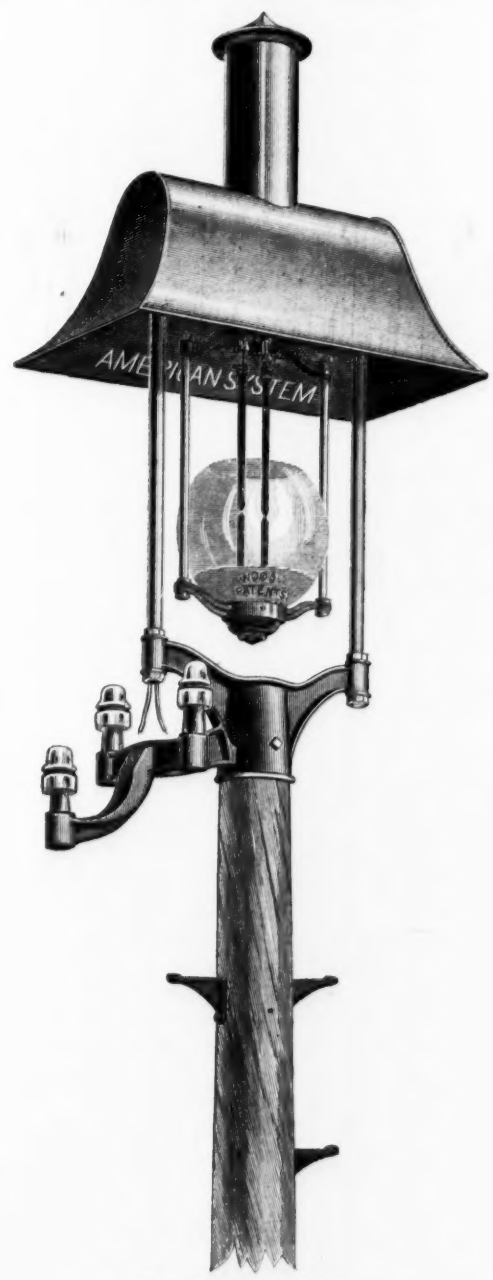


Fig. 7.—Lamp Post.

cement, in which condition they remain for about a week, by which time the whole becomes solidly welded together. The mass is then operated upon by his patent carbon cutting machine, which can cut thousands of carbon plates at one process from one-eighth of an inch and upwards in thickness, and of any desired length or breadth. The action of the machine is very similar to that of granite and marble cutting machines. In the course of its reciprocating motion it does not vary in its rise or fall or in the stroke, no matter what the depth of the material it may have to cut through. This circumstance is due to the manner in which the machine is suspended to the overhead gearing. The grit or sand and water employed as the cutting medium are acted upon by the blades of the machines, of which there are between fifty and sixty in the one now at work, with greater and more uniform effect. After the work of cutting is finished the pieces of carbon are made into different sizes and shapes and ground down till they have a smooth surface upon a revolving wheel. Gas retort carbon has always been more highly esteemed by electricians on account of its great durability and high electrical conductivity than the compressed form of the material; but its excessive hardness has hitherto rendered its manufacture into wedges of the proper size and shape a work of considerable difficulty and expense. But after witnessing the surprising rapidity and neatness with which this machine does its work, it seems reasonable to expect that gas carbon will now be as readily available as the molded or compressed forms.

Electrolytic Polarization Produced by Small Electromotive Forces.*

by C. Fromme.

The polarization of platinum plates in dilute sulphuric acid was measured during the flow of the polarizing current, which was always so small as to produce no visible evolution of gases. Two forms of electrolytic cell were employed, the first open, containing two platinum electrodes in cells, joined by a tube containing a third, and a second form in which there were four equidistant electrodes contained in a glass tube. The acid employed varied in strength from 1 per cent. to 3 per cent., the amount of dilution not being found to produce any observable result. With the latter form of cell the two middle electrodes were joined to the battery through a variable resistance, the two outer plates being for the purpose

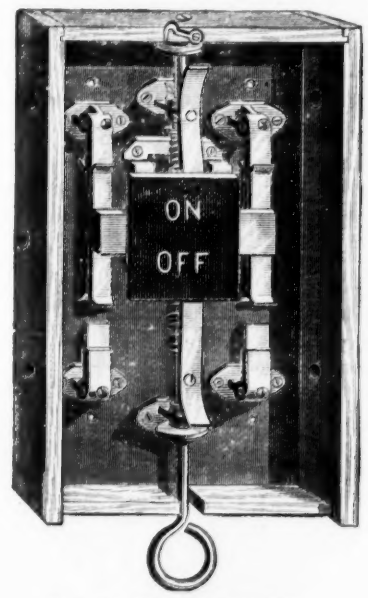


Fig. 6.—Wood Cut-Out.

of measuring the potentials of the others by connection with a quadrant electrometer. In the first set of experiments it was found that the maximum polarzation had occurred by the time the electrometer could be read, and the difference of potential was nearly equal to that obtained by joining the battery directly to the electrometer. Experiments with the open voltameter led to the conclusion that the difference of potentials between the plates remained nearly constant from the instant of making the current, but that the polarization of the oxygen plate continually *increased*, while that of the hydrogen plate *decreased*. In a voltameter free from air, the changes were similar, but in an opposite direction. The influence of a previous polarization of the electrodes was examined, the battery being joined first in the same direction, and secondly in the reverse direction to that of the former current, and also the effect of polarization of only one of the electrodes, this being effected by introducing temporarily a third electrode, and using it as an anode or cathode as required. By raising an electrode gradually out of the liquid, the effect of change of area was examined, and it was found that if either anode or cathode were raised so as to lessen its area of immersion, its polarization was increased at the expense of the other. Many other experiments were made, but without leading to any general conclusions, the author intending to extend the investigation, using gold and silver electrodes.

An Italian Torpedo Boat.—A novel torpedo boat, built by Messrs. Yarrow & Co., for the Italian Government, was tried recently on the Thames. The boat is the first of two ordered, is 140 feet on the water line by 14 feet beam, and is propelled by twin screws and compound engines capable of indicating between 1,500 and 1,600 horse-power. A dynamo-electric machine, driven by a Brotherhood engine, is fitted in the galley compartment for producing the electric light, and also the air compressing machinery for charging and expelling the Whitehead torpedoes.

* *Journal Chem. Soc.*

The Daft Electric Railway, Orange, N. J.

Our engraving on this page represents the latest type of the Daft electric car, which is now running on the first section of the Orange, N. J., Crosstown Railroad. It will be apparent that since the motor is situated beneath the car and the switches occupy an exceedingly small space, immediately in the front of the driver, practically no room is taken up by the motive system. The whole motor weight is placed directly upon the axles in such a manner that the vibration from the motor system is entirely eliminated and the resilience of the car is not impaired in the least degree. It is moreover of great importance that the balance of the car should not in any way be affected by the motive system, and in point of fact this mode of construction does not interfere in any way whatever with the proportions which the long experience of our best car-builders has demonstrated to be eminently desirable. The method of attaching the iron frame work of the motor to the axles includes an elastic cushion which, as noted above, not only absorbs all disagreeable vibration, but renders the car as noiseless in operation as any ordinary street car. Indeed, it has been remarked by those who have seen it running on the Orange road that it is less objectionable from this standpoint than the usual street car. When to this is added the fact that instead of an average speed of 5 or 6 miles an hour, 10 or 12 are easily obtained by an electric car, the argument in favor of electricity seems to be irresistible. Again, with the Daft system as here shown, turn-tables are entirely unnecessary, as the car runs with perfect balance and equal facility in either direction, and both platforms may be crowded with passengers without interfering with its facile operation. The interior of the car is brilliantly lighted by six incandescent lamps. A powerful electric alarm gong is governed by buttons within easy reach of the driver at either end. In order to provide for the well-known emergencies on roads acting as feeders to pleasure resorts, etc., ample power is provided for towing a second car without any appreciable loss of speed. This has already been demonstrated at Orange. It will be observed with reference to the engraving that two overhead wires are here employed, thus rendering the car absolutely independent of the track for conductive purposes—a most valuable feature when it is considered on how many days in this climate it is almost impossible to obtain a fairly good metallic contact between the wheels and the rails. The want of this contact has seriously militated against the successful operation of electric cars in some climates, where the track has been an indispensable part of the electric system. Its advantage also comes into play with singular force when the car leaves the track, as it is then able to replace itself with perfect ease, a fact which has already been shown two or three times on the Orange road for the purpose of experiment. It will be observed that belts, sprocket-wheels, chains and other devices which have hitherto been a severe reproach with some against electric motors are here entirely discarded. Beautifully cut gears are substituted. At present the line is run by a 12 horse-power New York Safety engine, which gives ample power for running two or three cars, but will be replaced by a larger installation when the whole line is finished.

CAR ON DAFT ELECTRIC RAILWAY, ORANGE, N. J.

On Varnishing Incandescent Lamps.*

BY NELSON K. CHERRILL.

In a recent number of *The Electrician* it is mentioned that Messrs. Siemens and Halske have recently adopted the system of dipping lamps in a thin semi-transparent varnish to obtain the effect of ground glass. As the writer has had much experience in this class of work, a few notes of the best mode of procedure may be of interest. The application of various modifications to the normal appearance of a lamp by means of varnish either colored or plain is by no means a novel expedient, and a similar plan has, I believe, been commonly employed in many places for decorative work.

The most important point in the application of varnish to a lamp is to get it to dry just in the right condition. Most kinds of varnish that will dry "bright" under ordinary circumstances will become "matt" if subjected to a chill, or to the action of damp during the drying, and at the same time many varnishes intended to dry with a "matt" surface, that would represent ground glass, dry "bright" if the conditions of drying are not quite suitable.

The class of varnish best adapted to this kind of work is what is known as photographer's negative varnish. This class of varnish dries almost as hard as the glass itself, and when well applied is very durable. When colored lamps are needed the varnish should be of a quality to dry "bright," but when the effect of ground glass only is required, the simplest way is to use what is known as "re-touching" varnish, which gives a "matt" surface at once. In default of this, the ordinary negative varnish can be easily modified to give the desired surface by the addition of a little weaker alcohol, which almost always has the desired effect; but if there is any difficulty, a little common resin, which chills very easily in drying, may be added to the varnish.

As to the mode of applying the varnish to the lamps, the best plan is to hang them on a frame by their contacts, so that a current can be passed through them during the operation. The lamps should be well washed in warm water, in which there has been dissolved a liberal dose of soda; a thorough rinse with fresh cold water should be given, and the bulbs should then be carefully wiped quite dry with clean linen rags. If the work is to be very nicely done, the operator who hangs up the lamps on the screen should have on linen gloves, as finger marks on the glass are apt to show when the whole process is finished. The varnish is poured into an upright glass vessel large enough to contain the lamp; a common drinking glass is as good as anything if large enough to admit the lamp. In pouring out the varnish care should be taken not to disturb any sediment which may be at the bottom, and if not quite clear it should be filtered, as it is of the greatest importance to avoid any small floating particles, which would cause spots or streaks on the finished surface.

All being ready, the varnish is to dry bright, *i. e.*, for colored lamps, etc., switch on the current to the lamp for a few moments, so as to render it slightly warm. Then turn it off, and taking the glass of varnish in the left hand, raise it under the lamp until the whole globe is immersed. If the lamp is in any kind of rigid fitting it will be very easy to immerse it, but if it is merely hung on a couple of wires, it will require the aid of a little instrument, consisting of a forked piece of wood, to push the globe down into the varnish. As soon as the varnish entirely covers the globe, lower the glass with one steady movement, so that the draining off the superfluous varnish shall be commenced in one even wave all over the globe: any hesitation or pausing in the motion of the glass will be almost sure to cause a line on the finished lamp.

As soon as the tumbler of varnish is quite clear from the lamp turn on the current again, and leave it running, while several more lamps are being done. When about twelve lamps have been varnished the first will be ready to come off. But a little care must be taken till the lamp is quite cold, as some varnishes will finger mark readily at this stage. If the varnish is to dry "matt" the lamp should be plunged quite cold, and no current should be put into the lamp till the varnish has chilled all over, then a little warmth will aid the drying, and will also harden the varnish. Almost any color can be given to the varnish by the simple use of Judson's dyes, which will readily mix with the varnish and impart their characteristic tints.

Blue is the most difficult color to arrive at satisfactorily, as the dye does not seem to blend so well with the varnish as the other colors, and, besides, the color is spoilt by the yellow tone of the light. To avoid this part of the difficulty the lamps which are to be used blue should be run as *hot* as possible, while those for red or yellow colors may be comparatively cool, the yellow especially so.

It goes without saying that all the testing of the lamps must be finished before the varnishing is commenced.

A pleasing effect is sometimes produced for purely decorative work by using a little dye with the "matt" varnish.

* London *Electrician*.

The Telephone in Stockholm.

To the Editor of The Electrical World:

SIR: In THE ELECTRICAL WORLD of the 5th March, I read an article about the so-called "Swedish Telephone Palace." Having visited Stockholm lately, and taking a great interest in the telephone business which American initiative brought over to Europe, I think it is just to say that the Allmänna Telephone Company has more subscribers than the Bell Company. The former prides itself upon being something national and original, although I am told the great thing is nothing but a wholesale copy of Bell; perhaps also the Bell Company does not beat enough the drum of réclame. However that may be, it is a fact, and this ought to be known, because the Allmänna Company takes care to hide it, that the Bell Company has about 1,800 to 2,000 members, amongst them the principal administrations, all the bankers, companies, brokers, merchants' offices, important shops, and besides some 500 private residences. It is evident to people with some experience in telephone matters that the surplus in favor of the Allmänna Company must consist of a lower class of subscribers. It is also a fact that the Bell Company opened the first telephone exchange in Stockholm, having been the pioneer of that industry for Sweden, and, moreover, that the public always recognized its service to be the best. It is true, too, that a high degree of centralization exists in Stockholm, which simplifies the service and saves time and money, only it is to be observed that this system, together with the multiple, is being worked only by the Bell Company, whereas the Allmänna Company is still operating with *three* central stations, and partly with switch-boards of the old system. The so-called "Swedish Telephone Palace" may have some advantages, but if it is a fact that nowhere else in the world has such a telephone tower been built; it is also a fact that a neutral telephone man, consulted in the matter, said: "Considering the progress made in and great future of cable constructions, this tower is a most ridiculous piece of telephone work, a wasting of money." Perhaps the Allmänna intends to illuminate Stockholm with it. Who knows? Poor shareholders! To be pitied the more so as they have to subscribe to two companies. Of course a service so divided can never be so perfect as with one single company. The competition of several telephone companies in one town is an evil that has been done away with wherever it existed in Europe. The happy time of a unified service will no doubt also come for Stockholm. The question is merely, will the Allmänna Company really succeed in taking the wind out of the sails of the Bell, or will it suffer the fate of the frog in the fable,—bursting in the effort to make himself too big? I rather think the latter.

What is still to be admired, however, is that in spite of these extravagant buildings and constructions, the subscription rates are extremely low, say about $20 to $30 a year. This is certainly the principal reason why the telephone is so much in use in Stockholm, but also why the Bell Company does not pay any dividend. The greatest wonder is, however, that with the very same low rates, the Stockholm Allmänna Company has promised its shareholders a yearly dividend of not less than 8 per cent.

SWEDEN. A TELEPHONE INVESTIGATOR.

The Aurora in Sweden.

During the past month, we learn from *Nature*, there have been several fine displays of the aurora borealis in Northern Sweden.

The displays generally began about 8 P. M., and continued till towards midnight, the point of culmination being reached about 11 o'clock.

The aurora appeared in the form both of streamers and clouds, the colors being mostly white and yellow.

Wicks' Railway Cab Signal.

The frequent accidents occurring upon railroads from the neglect of locomotive engineers to watch the signals displayed, or their inability to see them on account of fog and heavy weather, has led to the study of means for giving an audible signal in the locomotive cab when a train has reached a position of danger on the track. One of the most recent of these devices is that designed by Mr. P. J. Wicks, of Brooklyn, E. D., N. Y. It possesses several novel features.

Our illustration, Fig. 1, shows a locomotive and the connections employed which cause a bell to ring when a locomotive and train enter upon a section immediately behind another train. The engine, it will be seen, has a pair of wheels, insulated from each other, one of which bears upon a single conductor and the other upon a double conductor laid along the centre of the cross-ties. These wheels are electrically connected to a bell in the locomotive cab.

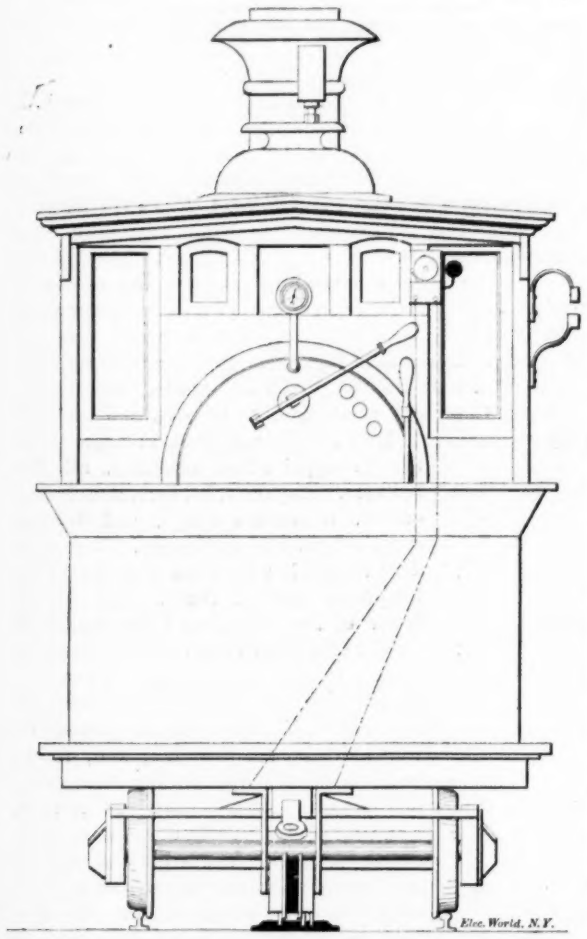


FIG. 1.—RAILWAY CAB SIGNAL.

The manner in which the signals are effected is shown in Fig. 2. The conductors upon the cross-ties are arranged as shown. Running the entire length continuously is the conductor *D D*, having a battery *M B* at either end of the line. This conductor is divided into suitable sections, depending upon the traffic of the road, which naturally regulates the nearness with which trains may approach each other before giving a danger signal. At each point of division there is placed a resistance *R R' R*, which is greater than that of the bell on the locomotive. At the side of this continuous conductor runs another *C*, which branches off sidewise at each resistance point, and both ends of which are open or insulated at the adjacent resistance points on each side, as is clearly shown. Now, supposing two trains have approached within adjacent sections or dangerous distance, —the trains going in the direction indicated by the arrow,— the bell on the rear train *B'* will ring in the following way: The current from conductor *D*, entering at the contact wheel *e*, passes into the bell *B'* back to contact *f*, over *c'* to the other contact wheel *e'*, and continues on the line. Thus *B'* will ring while *B* remains silent, since the circuit of the latter is open on either side of *f'*. The resistance *R'* being greater than that of bell *B'*, the greater part of the current will pass through the latter in preference to continuing through *R'*, and thus the signaling is effected.

When two trains are two or more sections apart the bell in neither cab will ring. This can be easily traced from Fig. 3, which shows that there is no continuous circuit through either bell.

The method of signaling can also be applied to indicate open and closed switch from a distance. This is shown in Figs. 2 and 3. The lever which operates the switch makes or breaks contact at *S* between the conductors *C* and *D*, according to whether the switch is open or closed. In Fig. 2, the switch being open, the contact *S* is closed, connecting *C* and *D* electrically. Thus the train *B* would have its signal bell rung to notify the engineer of the fact. The effect is evidently the same as if a train preceded *B* and closed the contact between the two conductors. In Fig. 3, the switch is shown closed, leaving the contact *S* open, so that the track, being clear, the engineer receives no signal.

This system is evidently applicable to signaling between trains at crossings. Where it is applied to that purpose on surface roads the central rails are dispensed with and contact is made by brushes on the locomotive, as shown in Fig. 1. These brushes bear against conductors placed on poles beside the track.

In addition to the audible bell signal, Mr. Wicks has arranged, in connection therewith, a drop signal which falls the instant the bell begins to ring; and thus attention is doubly called to the danger signal.

While especially designed to be used on elevated railways, the system is also applicable to ordinary roads, and Mr. Wicks has devised a similar method of signaling to be used in connection with electric railways, the current being furnished from the main conductors.

Variation of Contact Resistance.

BY T. D. LOCKWOOD.

I noticed in the issue of the ELECTRICAL WORLD of last week a paragraph entitled "An early reference to variable contact transmitters," by A. M. Tanner, and also an editorial reference thereto. I am always interested in antiquarian researches in electricity, and have perhaps delved as much as any one in the published matter relating to the subject. I am consequently glad to obtain the information which is new to me.

I conceive however that the title given to the paragraph is quite misleading. No rational person can be disposed to believe that a discovery of the circumstance that the resistance of an electrical circuit can be varied by variations in the intimacy of contact or amount of pressure between two electrodes, or between the particles of a spongy conducting mass through which a current passes, is a discovery or invention of a variable contact transmitter.

As well might it be said that the prior discovery, that when an electric circuit is broken, a current cannot flow therein, and that when it is made the current once more is reinstated, is an early reference to the electro-magnetic telegraph.

I desire also to notice that Mr. Tanner speaks of Du Moncel and Clerac as having advanced the theory of change of electrical conductivity by variation of pressure, but seems to intimate that the Beetz reference antedates both.

But Du Moncel goes as far back as 1856, and in his *Applications de l'Electricité*, edition 1856, Vol. 1, p. 246, the following paragraph is to be found:

"Une chose assez curieuse, et qui paraît être au premier abord en contradiction avec la théorie que l'on s'est faite de l'électricité c'est que la plus ou moins grande pression exercée entre les pièces de contact des interrupteurs influe considérablement sur l'intensité du courant qui les traverse. Cela tient souvent à ce que les métaux de l'interrupteur ne sont pas toujours dans un état parfait de décapage au point de contact, mais peut-être aussi à une cause physique encore mal appréciée. Ce qui est certain, c'est que, dans les interrupteurs où la pièce mobile de contact est solicitée par une force extrêmement minime, le courant éprouve souvent des affaiblessement assez notables pour faire manquer la réaction électrique qu'on attend d'eux." Which has been translated as follows:

"A somewhat curious fact, which at first sight appears to be in contradiction to the views ordinarily received as to the action of electricity, is that the greater or less pressure exercised between the contact pieces of interrupters has an important influence upon the strength of the current which traverses them. This often happens because the metal of the interrupter is not perfectly free from rust at the point of contact, but perhaps also because of a physical cause, as yet but little appreciated. This is certain, that with interrupters in which a movable contact piece is acted upon by a very slight pressure, the current often suffers such an enfeeblement as to cause a failure in the electrical action which was expected."

Electrical Theory and Practice.

BY F. R. H.

In the minds of the so-called "practical" workman of the day, there is a sharp line drawn between theory and practice. "Practice" to this workman means all that is worthy in, and all the existant facts of, his profession. For theory he has superlative contempt, while the theorist underates the capabilities and importance of the practical workman, and, unused to work himself, he cannot see the imperfections in his own elaborate theories.

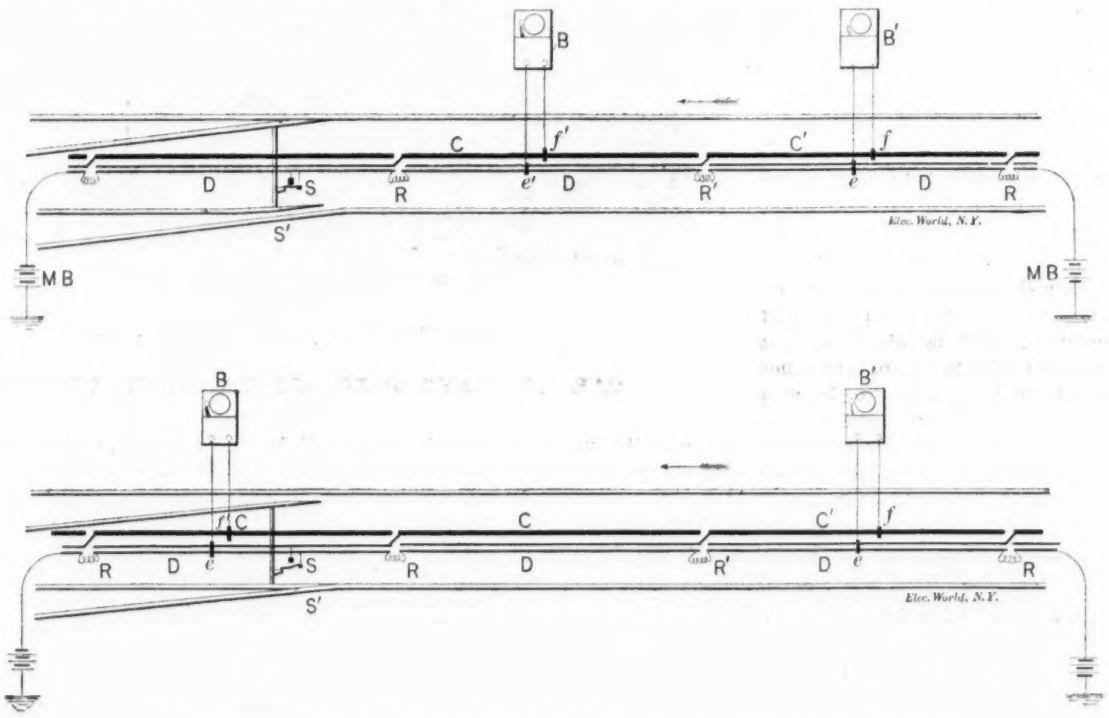
Between these two extremes is the workman who, while recognizing the strict thraldom of practical working, yet appreciates that it is through the study of theory that science advances. This workman endeavors to apply theory to practice, and it is by his expenditure of hand-work and mind-work that invention comes.

To those in electrical pursuits this combination of the practical with the theoretical is particularly necessary. From the nature of the subject, grave accidents might occur through the errors of the workman, who, disdaining the teachings of theory, goes blindly to work. Of course, on account of the rapid growth of the demand for electrical engineers and workmen, many are brought into positions which they fill ably, perhaps, but in a rule-of-thumb sort of way, which can but fail them as the subject widens. For these last I advise a study of the theories of electricity, which, in consideration of their already acquired practice, will not be very difficult, and which will be of great value to them.

On the Reversibility of the Induction Coil.

BY A. M. TANNER.

To complete the history of the reversibility of the induction coil extensively discussed at recent meetings of the National Electric Light Association and the American Institute of Electrical Engineers, I quote the following description from the English patent of Deprez and Carpentier, dated Sept. 24, 1881, No. 4128, for Distributing and Regulating the Transmission of Electrical Power: "Another mode of conveying an electrical current to a distance with as little loss of power as possible, is based on the following discovery: When a quantity current proceeding, for instance, from one or more elements of a Bunsen battery, is passed through the large wire of a Ruhmkorff coil high tension currents are produced in the small wire, which can overcome a large resistance, and can consequently be conveyed to a considerable distance without appreciable loss of power. If this high tension current be then made to pass through the small wire of a second coil at the receiving station, it will induce a quantity current that will have nearly the same force as the quantity current acting on the first coil, and which can then be employed as a motive power or for other purposes."



FIGS. 2 AND 3.—DETAILS OF CIRCUIT, RAILWAY CAB SIGNAL.

One of the claims in the patent is as follows, viz.:

"The method of conveying a quantity current to a distance with minimum loss, by first converting it into a high tension current by means of an induction coil, which current, after being *conveyed to the distant station, is there reconverted into a quantity current by a second induction coil.*"

Without further comment, it will be seen that Gaulard and Gibbs cannot claim priority of discovery of the reversibility of the induction coil, as claimed by Dr. Moses and others, in the discussions above mentioned, and, although Prof. Elihu Thomson has shown that in 1879 he performed certain laboratory experiments in which a Leyden jar current was passed through the thin wire of an induction coil, it is evident that Deprez and Carpentier were the first to propose a system of electrical distribution

in which "currents of high tension are converted at the receiving station or translating device into currents of low tension by means of induction coils."

The patent of Deprez and Carpentier sets forth the transmission and use of electrical energy, from alternating current dynamos, but it fails to describe the conversion of currents emanating from such machines by means of induction coils.

So far as is now known Messrs. Gaulard and Gibbs can hold their particular system, but it is quite evident that Deprez and Carpentier were the pioneers in proposing the "reversibility of the induction coil" in a system of electrical distribution.

A New Writing Telegraph.

The systems of fac-simile or autographic telegraphs, which have been heretofore proposed, have almost without exception employed sensitized paper to receive the current, which

FIG. 1.—WRITING TELEGRAPH—TRANSMITTER.

discolored the chemical used and thus left a trace of the writing or figure transmitted. A decided departure from this method was taken by Edward A. Cowper, of England, some years ago, who caused the movement of a pen at the sending station to introduce resistances into two electric circuits connected with the receiving station. The varying currents produced acting upon two electro-magnets at the latter station caused these to impart movements in two directions at an angle to each other to the receiving pen, whereby the latter was made to reproduce the original writing of the sending pen.

This idea was later hit upon independently by Mr. J. Hart Robertson, of this city, who carried it out and developed a practical instrument based on it, owned by the Writing Telegraph Company of this city.

The system can best be explained by referring first to

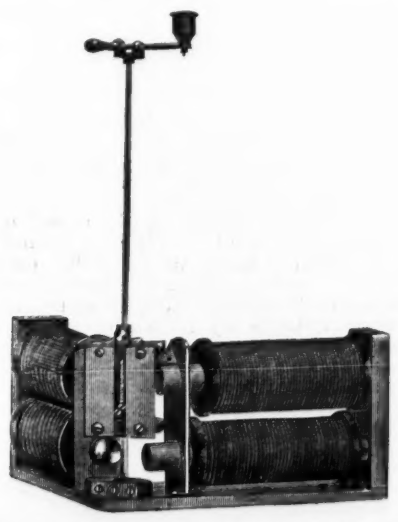


FIG. 2.—WRITING TELEGRAPH—RECEIVER.

the details. Taking up the transmitter, which is illustrated in Fig. 1, it will be seen to consist of a writing stylus which is attached by a ball joint to a vertical rod pivoted at its lower end, which is rectangular in shape. Surrounding two of its sides at the bottom of the rod are two ebonite boxes provided with binding screws and each containing a row of carbon discs. A pin bearing against the carbon passes through the end of each box and bears against a spring; and these two springs in turn bear against the adjacent sides of the vertical bar.

The discs of carbon are included in two independent battery circuits, and from the nature of carbon resistance it is evident that any movement of the writing stylus causes a change in pressure of the pin bearing against the carbons. This change in pressure, of course, varies the strength of the current in each circuit accordingly.

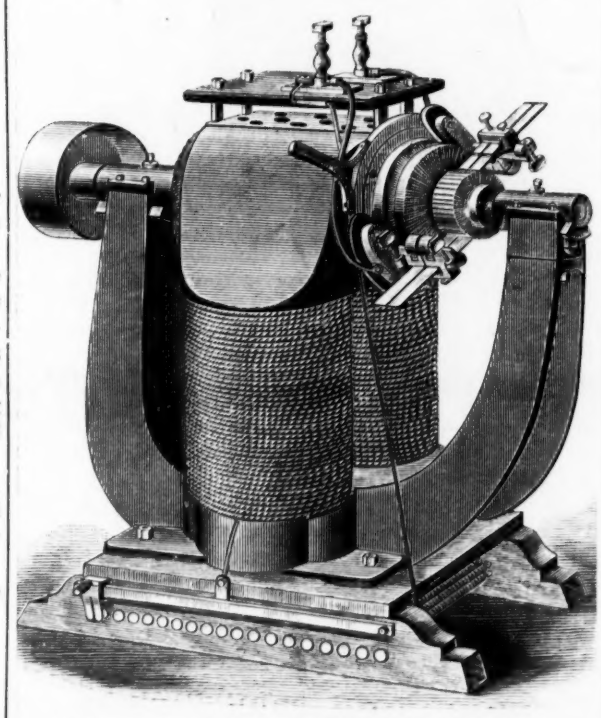
The receiver which is shown in Fig. 2 receives the impulses sent over the lines, and its action is plain. It consists of two horseshoe magnets, each of which is in circuit with a corresponding row of carbon discs. Opposite the poles of the magnets are two armatures connected together and supported by a spring wire which is extended upward and carries the receiving pen at the top.

Now if the writing stylus be pushed towards the carbon disc to the right, the strength of the current in that line will be increased, and the right-hand magnets in the receiver will be correspondingly increased in strength so as to attract the armature and move the receiving pen to the right. Similarly a movement of the stylus to the left will cause a corresponding movement of the armature and receiving pen. Any movement intermediate between these will vary the relative pressure on the carbon disc correspondingly and will so vary the relative strengths of the receiving magnets as to cause the armature and receiving pen to take up exactly the same position as the writing stylus. In this way writing done at one end is reproduced at the other.

The mechanism we have just described, together with the clockwork for moving the tape under the stylus, is inclosed within a box shown in Fig. 3; the writing stylus and receiving pen pass through above the top, as shown, together with the switch for putting the receiver in and out of circuit. In this form of instrument, which is the latest adopted, the writing stylus itself leaves no record, but the record is made by the local receiver, which the operator follows with his eye. In an older form of instrument, shown in Fig. 4, the writing stylus had a pen attached to it, and a broad strip of paper gave two records, one made by the receiver and one made by the writer's own hands. This has been found to be unnecessary, however.

As the hand of the operator in writing must be kept fixed while the paper travels it requires a little practice to become accustomed to this mode of writing. But a very short time suffices to learn the method, as we have experienced ourselves.

As stated before, two lines are required for each station,



HOCHHAUSEN MOTOR FOR CONSTANT POTENTIAL CIRCUITS.

each grounded at both ends. No local batteries are required, the entire battery being at the central office. From three to six cells are sufficient to work the instrument, and the subscriber has only to wind up the clockwork that moves the paper, the fountain pens being taken care of by the central office.

A writing telegraph exchange on this system is now in course of erection in Pittsburgh, which will connect subscribers in that town with Allegheny, and several sets of instruments have been in operation in Rochester, N. Y., for some time past.

A speed of 25 words per minute can easily be obtained by the instrument, and, with rapid writers and faster moving paper, as high as 35 and 40 words can be sent.

The Hochhausen Motor for Constant Potential Circuits.

In a recent issue, we illustrated Mr. Wm. Hochhausen's motor designed to be placed on arc circuits. In that machine, it will be remembered, the field coils were in series with the armature and the speed was kept constant by cutting in, or out, the successive portions of the field. In the motor designed by Mr. Hochhausen for incandescent, that is, constant potential, circuits, illustrated on this page, the regulation is entirely automatic, the motor having a shunt field of high resistance compared with that of the armature.

The motor shown is a 10 h. p., weighing 600 pounds and designed for 100-volt circuits. The figures are:

Resistance of armature	25	ohms.
" " shunt field	.023	"
Constant waste in shunt field	400	watts.

Without load the motor runs at 1,650 revolutions per minute, the counter E. M. F. being 99.954 volts; consequently but 2 ampères are passing through the armature at no load. At full load the number of revolutions is 1,630. The counter E. M. F. then falls to 98.2 volts, allowing 80 ampères to pass through the armature, causing a loss of 144 watts in the same. The total waste at full load is therefore 544 watts, while 7,856 watts, or about 10.5 h. p., is being utilized.

As the resistance of the armature is exceedingly low, it would be dangerous to throw the motor directly into the circuit from a dead rest, as an enormous current would pass into it, and cause its destruction. In order to avoid this a set of resistances are attached within the base below the motor, in series with the armature. As the speed of the armature increases, the counter E. M. F. rises and an equivalent resistance may be cut out until finally the entire resistance is removed from the circuit.

Ampere-Hour and Watt-Hour.

To the Editor of The Electrical World:

SIR: I frequently see the term "ampère-hour." Will you kindly give a definition of the term in your correspondence columns? H. L. G.

PEORIA, Ill.

ANSWER.—The term "ampère-hour" means an ampère flowing for one hour. It is a convenient unit for measuring and indicating quantity of electricity aside from and independent of any potential and electromotive force. It expresses quantity of electricity, and is, therefore, similar to the well-known term coulomb, the only difference between the two being that a coulomb is the quantity which flows per second when the current strength is one ampère, while an ampère-hour is the quantity which flows per hour when the current is one ampère. An ampère-hour is therefore equal to 3,600 coulombs. The term is used chiefly in connection with storage and primary batteries, to express the amount of electricity which the battery can supply, which is to a certain extent proportional to the amount or weight of the active material of a battery. Ampère-hours are calculated by multiplying the current in ampères by the time in hours or fractions of an hour. If the current changes during a test, it is correct to add together all ampère-hours calculated for each of the successive periods during which it is steady, provided the time is taken in hours and fractions of an hour, not in minutes or seconds. If the readings of the current are taken at regular intervals, it is correct to take the mean of all the current readings and multiply it by the

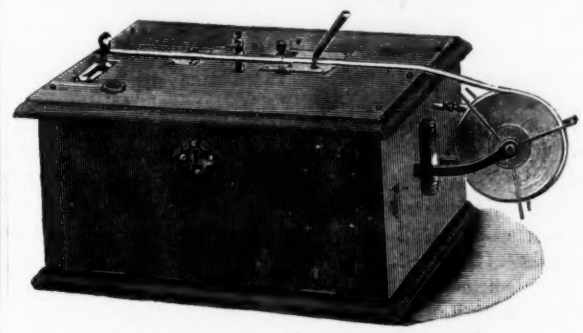


FIG. 3.—WRITING TELEGRAPH—CASE.

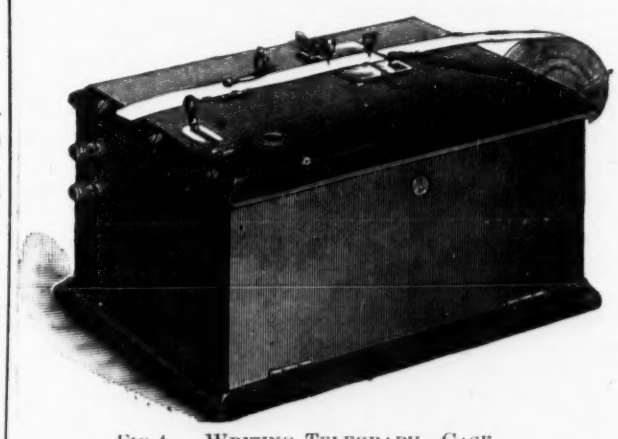


FIG. 4.—WRITING TELEGRAPH—CASE.

total time in hours, to get the total ampère-hours. The term does not represent electrical energy or horse-power, but merely quantity of electricity. It should, therefore, be carefully distinguished from the term "watt-hour," which is the number of watts of energy; that is, volt-ampères, multiplied by the time in hours. Ampère-hours multiplied by the volts of that current gives its watt-hours. For instance, if a lead storage cell has 100 ampère-hours it will have about 200 watt-hours, as its potential is about 2 volts; 746 watt-hours are equal to one horse-power-hour; a cell of 2 volts must, therefore, have a capacity of 373 ampère-hours to be a one horse-power-hour cell.—EDS. E. W.

The Interstice.

To the Editor of The Electrical World:

SIR: Please allow me to suggest the word "Interstice" to designate the space between the armature core and the field magnets. M. M. WOOD.

ERIE, Pa.

Preservation of Wooden Poles.

A simple method of treating wood with preservative solutions is employed in Norway for telegraph poles. After the poles are set in place, a man goes from one to another with an auger, with which he bores a hole in each post, beginning at a point about 2 feet above the ground, and boring obliquely downward, at as small an angle as possible, with the axis of the post, until the point of the auger reaches the centre of the stick. The auger-hole should be an inch in diameter, and, in telegraph poles of the ordinary size, will hold easily 4 to 5 ounces of sulphate of copper, which is put into it in the form of coarsely powdered crystals, and the opening then stopped with a plug, the end of which is left projecting as a handle, so that it can be pulled out and replaced. Just what action it may be that then goes on in the interior of the stick, no one pretends to say; but it is found that the crystals of copper sulphate disappear slowly, so that every three or four months the charge must be renewed; while the wood, both above and below the auger-hole, even to the very top of the pole, gradually assumes the greenish tint due to the presence of copper in the pores.

A New Battery Solution.

The usual method of preparing bichromate battery solutions consists in dissolving bichromate of potash in sulphuric acid and water. This solution, however, possesses the disadvantage of leading to the formation of chrome alum, which, besides increasing the internal resistance of the battery, disintegrates the elements and thus reduces the efficiency of the battery. In order to remove this difficulty Mr. Wm. R. Kookogey, of this city, has recently devised and patented a method of removing the base of the chromic salt in the form of crystals, leaving the chromium in the solution.

This is accomplished by adding boiling water to a certain proportion of bichromate of potash or bichromate of lime, and while the mixture is still at or near the boiling point adding sulphuric acid. The exact proportions are as follows: To eight ounces of bichromate of potash or nine

Figs. 5 and 6.—Small Electric Light Fixtures.

ounces of bichromate of lime, two-and-half pounds of boiling water are added. To this is added three and a half pounds (avoirdupois) of sulphuric acid of a specific gravity of 1.835. The solution so made is allowed to cool and to remain standing for about 24 hours at a temperature of from 60° to 68° Fahrenheit. The liquid is then siphoned off, and is ready for use; and the base or sulphate of the base will be found deposited on the bottom of the vessel.

Mr. Kookogey has also designed several forms of battery cells. In one of these designed for continuous lighting, the carbons, one inch in diameter, are arranged in a circle and supported by a brass plate, as shown in Fig. 1, where the plate rests on the top of a square box. In a like manner the zincs are arranged in a circle and placed within the carbons, Fig. 2.

The zincs dip into a porous cup filled with water, to which ordinary salt is added, while the carbons are surrounded by the chromic solution prepared as above. As there is scarcely any free acid present, very little local action takes place and the battery maintains its full power until nearly exhausted.

In some other form of cells Mr. Kookegey uses zinc cylinders, as shown in the dip battery illustrated in Fig. 3; Fig. 4 showing the same battery completely inclosed. Besides the batteries, the Kookogey Electric Manufacturing Company make very pretty and effective electric light fixtures, a few of which are shown in the illustrations, Figs. 5, 6, 7 and 8.

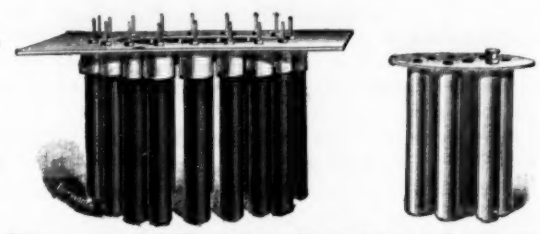
With the solution described above it is proposed to undertake domestic electric lighting, and an experiment in train lighting will also be shortly made.

Is Electricity Matter?

To the Editor of The Electrical World:

Sir: During the past few years I have advanced the following argument to a number of electricians, and having failed to find any one who can bring up any argument against it, I thought it might be of sufficient interest to be discussed in your paper. Possibly it may not be new, but I have never seen it published anywhere.

I believe it is conceded that everything in the universe is either force or matter; therefore electricity must be one or the other. If it is matter it must remain the same in amount and can never be consumed or generated. If it is force it may be generated by the expenditure of another force, as of a steam engine, for instance, and it will then *grow less in amount* as it is again converted into other forces, as in motors, lamps, storage batteries, or in heating wires. Now it is a well-known fact that quantity of electricity measured in coulombs never is generated, never is consumed, and never does grow less in the circuit, barring leakage. The current flowing out of a lamp is exactly the same in quantity as that flowing into it; the same is true of motors and of generators, showing that electricity itself is neither consumed while doing work, nor is it generated; after doing work in a lamp or motor it comes out in pre-



Figs. 1 and 2.—Kookogey Battery for Lighting.

cisely the same quantity as it entered. Connect one pole of a battery to a circuit and you will have no current. Why? The battery is not able to *generate* quantity or coulombs of electricity; all it is able to do is to take the quantity which flows in at the negative pole and to send it out at the positive pole with an increased *pressure*, or electromotive force. The battery, therefore, does not generate electricity, but merely raises the pressure of the electricity. Electricity is, therefore, not force, but matter. It is precisely analogous to water in a water circuit. The water is neither consumed nor generated. The pump merely increases the pressure of the water which flows in at one

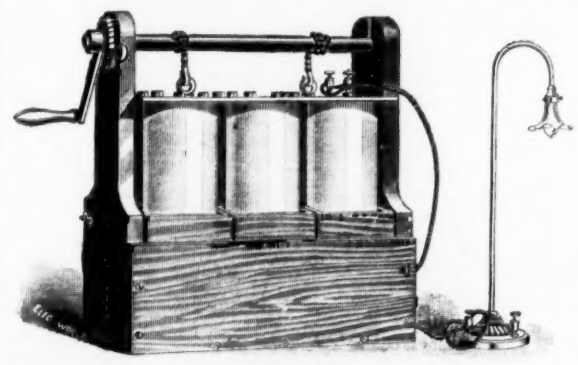


Fig. 3.—Kookogey Dip Battery.

end: the water motor merely consumes this pressure again and converts it into mechanical work of another kind, it does not consume the water. The quantity of water measured in units of quantity is the same in all parts of a closed circuit of water.

Perhaps it will be proved at some future time, as has been already suggested, that electricity is the ether (which is matter), whose wave motions are light, and which in some other form of motion is an electric current. Perhaps a current of electricity is the bodily conveyance of ether, as distinguished from a wave motion, which is light. In that case I would suggest that perhaps the

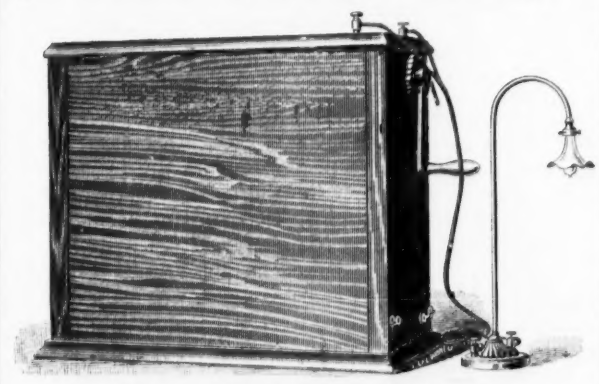


Fig. 4.—Dip Battery Complete.

relative motion of the ether of space and the revolving earth may explain the cause of the earth's magnetism. The magnetic polarity and direction at the equator are in accordance with such a theory, and the fact that the lines of force bend down into the earth at the magnetic poles may be explained by the well-known fact that lines of force are continuous circuits; they must return somewhere, and they select the axis of the earth, as there is no motion there to develop a counter magnetism. They cannot return outside of the earth, as lines of force cannot intersect each other, and in order to return outside of the earth they would have to intersect, as can readily be shown. Furthermore, observations show that they do not return outside of the earth.

The only plausible arguments which I can find against the theory that electricity is matter, are that it may be a combination of force and matter, as for instance a wave motion; or it may be that the real current is in the *same* direction in both wires leading from a machine, therefore the electricity may emanate from this machine and consequently be force.

Carl Hering.

Philadelphia, April 12, 1887.

The Bentley-Knight Electric Railway System in England.

We have received from the Bentley-Knight Electric Railway Company the following copy of a communication addressed to the London *Electrical Review*:

"We have read with considerable interest the communication from Mr. Holroyd Smith, lately published in the *Review*, and which refers to the Bentley-Knight electric tramways about to be constructed in Fulton street, N. Y., and elsewhere.

Mr. Smith assumes that he alone is the source of all original ideas in electric railways, especially conduit tramways, and that all other inventors but copy his devices. He furthermore "ventures to predict" the failure of the Bentley Knight system, and threatens this company with the terrors of his patents.

In reply to his effusion, we beg to state that the likeness existing between the Bentley-Knight and Smith systems begins and ends with the fact that in both a conduit is used.

Mr. Smith is not the originator of the conduit road. Years before he became an inventor it was first described in a U. S. patent, and that patent must have been introduced into England, in regular course of transmission, long before his alleged conception of the idea.

The Bentley-Knight system is, moreover, not a matter of speculative success, but has been proved reliable and practical by nearly four years of actual operation under the severest conditions.

Neither the "blue-books" of Mr. Smith, nor his U. S. patents, have any more bearing on Bentley-Knight railways than a Papal Bull would have. He has three trivial patents in the United States limited to the smallest details of his device, which were taken out long after the Bentley-Knight system was in operation, and which are not infringed upon by it.

Both Mr. Bentley and Mr. Knight were at one time experts in the electrical division of the U. S. patent office, and know perfectly well how strong their position is. Mr. Smith is cordially invited to bring suit on his patents at the earliest moment; and we beg, furthermore, to say that this company, having patented its devices throughout all Europe, contemplates an early entry into England with

Figs. 7 and 8.—Small Electric Light Fixtures.

its system, and sincerely hopes to have the pleasure of exhibiting to Mr. Smith a thoroughly practical railway upon which he can use his "blue-books" at will.

Robt. W. Blackwell, G. M.

The company add: As an afterthought, we beg to inclose herewith clippings from the English *Electrical Review*, which appeared in that paper March 18, the week following Mr. Smith's amusing composition to which we have referred. The gentleman who composed it is evidently a profound admirer of Mr. Smith personally, his system and his business methods.

"Letters to public journals are so often used as a means of cheap advertisement that a reply to Mr. Smith may be only working into his hands to effect that purpose; but such considerations must not deter me from answering his letter relative to the Bentley-Knight system of electric tramways which appears in your issue of the 11th inst. He, with that characteristic modesty which is appreciated by all who know him, indicates that nothing else exists as a system (?) outside the inventions of his own fruitful brain, and we may be pardoned in the public interest for presuming to disturb his assumptions. Looking at the history of electric tramways, we see no reason for discounting the independent efforts of other inventors than Mr. Smith, nor for considering him as the only practical pioneer of this important branch of engineering. Successful work in Paris at the Exhibition of 1881 demonstrated the electric tramway as an accomplished fact, while in America Edison, Daft, Adams and others had made similar progress, but at this date Mr. Smith had not yet turned his master mind to this subject. It was not till considerably later that the magnificent idea dawned on Mr. Smith (after seeing the Halliday cable system of conduits) that conductors might be laid similary in conduits, and in lieu of a grip, a sliding contact should be introduced to operate a motor to propel a tram car!! And here was the germ of rendering electric traction practicable. From that date other systems, such as the Portrush, Volk's, Siemens' in England, besides numerous American and European inventions were as nothing and Mr. Smith's everything, and so according to his letter it is at present. It now only remained for Mr. Smith to put his ideas into practice. Experiments with apparatus at Halifax, information gleaned from manufacturers of dynamos who hoped in the future to be able to obtain orders for the same work at Blackpool Winter Gardens, paid for by others who enjoyed nothing beyond that privilege, all helped rapidly to advance the 'system' Smith; and today we learn that American inventors must pause ere they venture on work involving ideas entertained before even Mr. Smith's advent, or they may be dealt with as infringers of his valuable patents."

The Passage of an Electric Current through Air.

In the *Beiblatter der Physik* the following singular experiment is described by J. Borgmann. One terminal of a delicate reflecting galvanometer is connected with the earth, and the other with a platinum wire, which is placed in the flame of an insulated spirit lamp. At a distance of 1½ metres from this lamp is an ordinary Bunsen burner, which is connected with the conductor of a Holtz machine; the other conductor of the machine is put to earth. The spirit lamp being lighted care is taken that no deflection is caused by thermo-electric currents. The discs of the induction machine are then rotated, when a current is at once indicated upon the galvanometer, and the deflection remains constant so long as the machine works at a uniform rate. If the Bunsen burner is connected with the other conductor of the machine, the direction of the current is reversed.

Transformers with Relays and Commutators.

To the Editor of The Electrical World:

SIR: I wish to obtain some information about "transformers." If I should interpose one in the circuit of an ordinary alternate current telephone call-bell, could I get a current in one direction strong enough to operate a relay? If not, could I do so with the aid of an interrupter; that is, with an ordinary induction coil reversed?

CALUMET, Mich. C. H. VEEDER, M.E.

ANSWER.—If you connect the fine wire of a transformer with a telephone call-bell circuit having an alternating current, you will get in the thick wire a current of greater quantity but less intensity; this secondary current will, however, be an alternating current. You can, nevertheless, operate a relay with it provided you use a polarized steel armature with this relay. If, however, the alternations are not too rapid, you can use a soft iron armature with the relay magnet, provided the armature is very light, but it will probably be found more satisfactory to use a polarized armature. You may be able to change this secondary alternating current into a direct but intermittent current in a reversed Ruhmkorff coil, if you use a polarized armature in place of the interrupter, and make this armature actuate a commutator placed in the secondary circuit. The movable parts will have to be very light and the alternations should not be too rapid.—EDS. E. W.

Strong Currents in Small Magnets.

To the Editor of The Electrical World:

SIR: Will you please answer the following question? What is the effect (if any) on an instrument (sounder) wound with very fine silk-covered wire of about 20 ohms resistance, when short circuited with, say five strong bichromate cells arranged in series? Would it in any way harm the power of the instrument for further use? X.

BROOKLYN, N. Y.

ANSWER.— Five strong bichromate cells will give a potential of about $1.9 \times 5 = 9.5$ volts; this, when short circuited with 30 ohms, will give almost ⅓ of an ampère. If the wire is very fine and the coil thick, as it probably is, this current, if passed continuously, would no doubt heat the magnet too much. It would not injure the magnet for further use, unless the insulation has thereby been injured. If the current is intermittent, as it would be on an open circuit line, this strong current would not harm the magnet, but would no doubt injure the contacts of the key as it would probably spark there, owing partly to the strong current and partly to the increased self-induction of the magnet, which probably has very many turns on it. The effect on the sounder would be to make it quite powerful, but the magnet, if small, is no doubt very much over-saturated with magnetism, so that a smaller current would do almost as well.—EDS. E. W.

Circular Mils.

To the Editor of The Electrical World:

SIR: Kindly inform a constant reader of your paper of the meaning of the term "Circular Mil," and what a circular mil is? ELECTRIC.

NEW YORK CITY.

ANSWER.—A "mil" is the thousandth part of one inch. A circular mil is the area of a small circle whose diameter is one mil; that is, one thousandth of an inch. A circular mil is therefore .7854 (or a little more than three-quarters) of a square mil. The cross section of a wire expressed in circular mils is simply the square of its diameter in mils or thousandths of an inch. The object of this unit is to avoid having to multiply by the quantity 3.1416 or .7854 in calculating the area from the diameter. If the cross section is given in circular mils, and it is required to reduce it to square mils, multiply by .7854; if it is in square mils, and it is required to reduce it to circular mils, multiply by 1.273. The new Edison system of wire gauge is based on this system of circular mils. The gauge number, for instance No. 3, represents so many thousand circular mils cross section; that is, 3,000 circular mils.—EDS. E. W.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
NEW YORK, April 18, 1887.

I find all the arc and incandescent companies active, with factories running full time and orders coming in briskly for apparatus. I think it likely that we shall soon hear of various new departures in the line of incandescent work. The arc business will, however, go on pretty much as before, except that a good many of the local companies are kicking and growling about the carbon combination. I do not know, however, that that will improve matters.

The demand for belting is a fair indication of activity in the lighting field. Mr. H. B. Lawrence, of the Cotton-Leather Belt Company, 82 John street, has taken some large orders. One is for ten-inch belts for the Edison plant at Tokio, Japan, to go with New York Safety engines. The Mather-Westinghouse plant at Hartford, Conn., takes 4 belts, and the new Edison station in Boston takes 16, all told. Belts have also been ordered from him for the Sawyer-Man plants in the Bergenwood silk mills, N. J. (with New York Safety engine), the Steinhardt flats, Sixtieth street and Ninth avenue, and the American Exchange Bank. The new Thomson-Houston plant for New Rochelle, with Safety engine, takes 2 belts; the Edison plant in the Aldrich building takes 4, with Straight Line engines, and the Waterhouse plant at Hearn's on Fourteenth street also receives a cotton-leather belt outfit.

The Union Fire-Alarm Company, 145 Broadway, finding they need more room have moved to the third floor there, rooms 30 and 31. Their system, now complete in every detail, and without any expensive extra attachments and miscellaneous paraphernalia, is quite popular and greatly in demand.

The United States Electric Engineering Company have moved their New York office to 18 Wall street.

The Callender Insulating and Water-Proofing Company will hereafter be comfortably settled in the new Aldrich Building. They have a splendid view from their office windows of the Hudson, etc.

At the meeting in this city, on April 12, of the Association of North American Railroad Superintendents, Mr. Giles, of the Anti-Magnetic Shield and Watch Case Co., of Chicago, exhibited the magnetic shield for watches made by his company and made some interesting experiments, showing the actual workings of the device. Mr. Giles also showed an ingeniously arranged watch face, arranged for the 24 o'clock system. The outer portion of the face, occupied by the figures, is partially covered, so that they appear through openings like the day of the week in a calendar clock. At noon, by a simple cam arrangement beneath the dial, the figures suddenly shift, and 13, 14, 15, etc., appear in place of 1, 2, 3, etc. At midnight the smaller numbers reappear in the same manner, displacing the afternoon hours.

The dividend of the American Electric Manufacturing company for March quarter was declared last week, 1½ per cent. President Goff has issued a circular to the shareholders, in which he says: "The business of the company has outgrown its present office accommodations in the Mutual Life Building. It has, therefore, become necessary for us to remove to quarters where we can have adequate room for all departments of our rapidly increasing business, including warerooms for all kinds and sizes of dynamo machines, lamps and other electric apparatus and appliances, which we manufacture. In conformity with the necessity for more room, the company have taken a long lease of the second floor of the new Metropolitan Telephone Building, at 18 Cortlandt street, near the Sixth Avenue Elevated R. R. Station. We expect to move into our new quarters on or about May 1st next."

As to the carbon pool, about which talk is still lively, I take the following from a Cleveland paper of April 15: The following carbon companies have entered into an agreement to maintain a uniform scale of prices for carbons for electric lights: The Brush Electric Company, the National Carbon Company, the Boulton, the Cleveland and the Crystal, of Cleveland; the Pittsburgh, of Pittsburgh; the Richmond, of North Adams, Mass.; the Buffalo Electric Works, the American Carbon Company, of St. Louis, and the Parker Russell Mining and Manufacturing Company, of St. Louis. These are all the companies in this country devoted to this business. All except the Brush Company have appointed a sole selling agent and are said to now receive no mail, it all being forwarded to their agent at the general headquarters in this city. If any orders for carbons are received without designating which company shall fill it, the agent selects the company to fill it. It is the intention to manufacture only one grade of carbons. The price two years ago was $35 a thousand, but the different companies began cutting until the price was reduced to between $10 and $15 a thousand and even $5 delivered on large orders. The new price ranges from $20 to $30 a thousand. On and after to-day all orders are to be filled at the new price. The demand for carbons is about 150,000 a day, while the full capacity of all the companies mentioned above is 200,000 a day.

The last quarter's statement of "K. K." wire, rendered by Holmes, Booth & Haydens to the inventors, shows an annual business in that specialty of over $20,000. The Fire Department of this city has used the wire largely for some years as well as the police and fire departments of other cities, and nearly every electrical and telephone company in the country. The wire has evidently gained a good place for itself on its merit, yet I doubt whether half a dozen people have known why it is called "K. K." It is named after the patentees, Mr. Knudson, who is well known in the electrical business, and Mr. Kane, a dealer in refined asphalt and roofing goods.

On Saturday, April 16, the fine new headquarters of the Fire Department at East Sixty-seventh street and Third avenue were formally opened and "turned over." It is one of the few fine buildings that the city officials can call their own, and shows what could be done if Mayor Hewitt carried out his rather magnificent idea of housing all the city departments in one fine central City Hall, something like those in Philadelphia and Chicago. There was a good gathering of notables, and I must say we all met with a cordial reception. An exhibition was given by the Life Saving Corps of its skill and agility, and the whole building was thoroughly inspected by the visitors. Mr. J. Elliott Smith, the efficient and courteous superintendent of telegraphs, is still busy getting his office and apparatus into order. Being the brain and nerve centre of the fire service, it is fitly located in an upper story. The apparatus occupies a fine front room, with offices adjoining, and a large battery-room in the rear. Messrs. Pearce & Jones, who have, as I noted some time ago, the contract for the removal and renewal of the telegraph department, are busily engaged, and will, I think, make an extremely neat piece of work of it.

I am sorry to see that a fire occurred on Sunday in the *New Yorker Zeitung* building, Frankfort street, as it did some little damage to the factory there of Mr. Bossard, manufacturer of arc lamps. The lamp made by Mr. Bossard is, by the way, one that can be obtained from him by any responsible parties in large or small quantities as desired.

Mr. J. C. Vetter, 213 East Forty-seventh street, is busy on his electro-medical goods. Just now he is turning out some very ingenious diminutive Leclanché batteries, composed of a small glass cell 5½ inches high and 1½ inches in diameter, divided in the centre by some porous material, one compartment containing the carbon and the other the sal ammoniac and zinc. The battery is said to be an excellent open-circuit one for all purposes, and Mr. Vetter is specially adapting it to medical uses, in a shape that he will shortly bring out. He has had three on a bell for some months now at steady work.

Mr. A. T. Smith, 6 West Fourteenth street, is offering to the trade a unique device for cutting in electric gas-lighting burners from a central point. It is being extensively introduced. The name given it is the "automatic push-button." The "button," or box rather, has metallic ends 4 or 5 inches high, and about 3 inches wide. The sides are formed of glass, and the top and bottom are metal. On the top, a magnet holds a slide adjusted to a hole there. When the circuit is closed, the magnet draws the slide and allows a metal ball to drop on two metal rods, inside the box, and balanced at one end. The weight of the ball tips the rods, closing the gas-lighting circuit, and the tipping also allows the ball to roll forward and downward to similar rods below, balanced at alternate ends, at each drop closing a separate circuit. The value of such an ingenious device is very perceptible. When a burglar attempts to enter a door or window, this machine will ignite the gas, and the alarm will rouse the household or watchman. One advantage is that it does not keep the gas light circuit closed while the alarm bell is ringing. Another use for this button is in connection with clocks in mills and factories to give alarm as often as wanted, especially at 7 A.M., 12 noon and 6 P.M.

The two companies hitherto operating independently the systems of telegraphing to and from moving trains have now consolidated and will be known as the Consolidated Railway Telegraph Company. The following officers have been elected: President, Ch. A. Cheever; Vice-President, Ch. B. Crowell; Secretary and Treasurer, Henry D. Hall; Superintendent and Electrician, Lucius J. Phelps; Consulting Electrician, Thomas A. Edison. The capital of the company is $2,500,000. By this consolidation the Phelps Induction Telegraph Company, owning the Phelps patents, and the Railway Telegraph and Telephone Company, owning the Smith, Edison and Gilliland patents, are united into a single company, under one management.

The acoustic telephone business has a new representative in the Sunderland Telephone Company, of 39 Broadway, who have a good telephone. I talked over a line of 700 or 800 feet last week, with excellent results, although there were a number of angles in the line. I heard a watch tick, and a musical performance came very well, indeed. The price of the instruments is extremely moderate, and they are highly spoken of by parties of reputation who have them in use.

Haines Brothers are back in their old home at 53 Broadway, as street and suburban, or short line, railway contractors. They have constructed a number of roads lately and now have half a dozen franchises on hand. They have contracted for a Daft electric railway up at Ithaca.

E. S. Greeley & Co., 5 and 7 Dey street, have been appointed general agents for the Edison Lamp Company, for the sale of incandescent lamps, for experimental and general use. They will carry in stock all sizes from ½ c. p. to 150 c. p., of all resistances, etc.

The Mutual Electric Manufacturing Company are moving from York and Washington streets, Brooklyn, to 292 Graham street, Tollner Building, Brooklyn. The demand for their specialities has so increased that they require more room, and they will occupy two floors instead of one.

The Mutual Accumulator Company, using the Julien storage system, has been incorporated in Brooklyn. It will have office and factory at 292 Graham street, and will introduce the battery for light and power, especially for house lighting. W. T. H.

AUBURN, N. Y., April 15, 1887.

The fair now going on here is an industrial and art exhibition, and taking it all together, it is the best thing of the kind ever seen in this section. The Auburn Electrical Supply Company, for whom Mr. Adams is the manager, have a fine exhibit of everything in their line. At the right of them is the Auburn Electric Watchman's clock. It is a good piece of mechanism and includes a very reliable fire-alarm. Mr. Gilbert is the general superintendent and manager. They have a well equipped shop for turning out all the cases, clock movements, and the parts necessary to make a complete apparatus. On the left of the supply company is the electric motor department. A 1 h. p. motor is running a printing press; a ¼ h. p. is on a buffing and polishing lathe, a ⅛ h. p. runs a heavy sewing machine on slippers. Several $\frac{1}{16}$ h. p. motors run sewing machines, small scroll saws; peanut roasters, lead pencil sharpeners, etc., and one motor runs the generator for the telephone exchange in the electrical supply department. A small electric motor hidden in the drapings of the bicycle department causes a great deal of wonder and amusement. It runs a bicycle in a novel way. The belt wheel runs against the rubber tire of the bicycle, making it just "hum," and the question with the bystanders is: What makes it go? The Auburn Electric Light Company expects to sell several motors before the fair closes. The company has, besides the motors, a 50-light Brush incandescent machine in "Power Hall" driven by a Mackintosh & Seymour high speed engine, furnishing light for the Art Gallery. There is thus an exhibit of arc, multiple arc, multiple series, series incandescent (65 c. p.), and direct incandescent lighting.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, April 19, 1887.

Steps are being taken in Millbury, Mass., to organize an electric light company. It is said that the stock is rapidly selling among the business men of that town.

The success of the various systems of electric lighting in Boston has, it appears, compelled the Boston Gaslight Company to make recently another reduction in its price of gas from $1.50 per 1,000 feet to $1.40. July 1, 1884, a reduction from $1.80 to $1.50 was made.

The Woburn, Mass., Electric Light Company is making arrangements to light the streets of that town in accordance with the vote passed at the town meeting on April 14. That is, arc-lights are to be used hereafter for street lighting in conjunction with incandescent lights; the latter having been used exclusively on the streets for upward of a year.

On the evening of April 11, the Newton, Mass., Common Council discussed the electric light question, and adopted an order appropriating $2,000 additional for lighting the streets with electricity. The order authorizing a contract with the Newton Electric Light and Power Company for lighting a certain number of streets, which was tabled about a month ago, was resurrected and favorably considered and finally referred to the Committee on Street Lights.

A bill from the Committee on Manufactures of the Massachusetts Legislature gives the Gas Commissioners supervision of electric light companies as fully as they now have supervision of gas companies. In cities and towns where one electric light company has been established, no other can be established without consent of the Commissioners, obtained after a public hearing.

It is reported that the local companies at Brockton, Mass., using the Jenney arc and Edison municipal systems have consolidated and that business will be conducted under the name of the Edison Electric Light and Power Company. The Edison Company has begun extensive alterations and improvements in its station, and when they are completed the arc-light company will move all its equipment to the Edison building.

The West End Land Company, of Boston, and the Cambridge, Mass., Electric Light Company held a conference on April 15, when it was arranged that the latter company should supply electricity as a motive power for a trial car over a portion of the tracks of the Cambridge railroad. The electrical experiment is to be made within a month, and if satisfactory, motors will replace horses as a means of motive power between Cambridge and Boston.

As stated in THE ELECTRICAL WORLD, April 16, Mr. J. H. Vail, general superintendent of the Edison Electric Light Co., was in town last week making arrangements for the construction of the No. 2 Edison station to be erected on Bowker street, in this city. Since the construction of plants has been added to Mr. Vail's department, he has effected a radical change in the method, which is now so thoroughly systematized as to insure successful working plants in every case. Many plants also which have not been giving satisfactory results in a pecuniary sense, have been taken in hand and put on a paying basis. He has also devised a system of monthly returns from the different Edison stations, whereby a comparison may be made as to cost of fuel, running expenses, etc., and if there are any defects, either in construction, management or operating, they can be readily shown and rectified. As a result of these labors, where this company undertakes or supervises the construction of a central station, it is of itself a guaranty that it will be as economical and successful a plant as can be devised, and the Edison Company shows great wisdom in adopting this method, and also in placing the matter in the hands of one having such an extended experience and varied knowledge as Mr. Vail has obtained.

At the regular monthly meeting of the New England Railroad Club, at its rooms in the Boston & Albany passenger depot, on the evening of April 12, the subject of lighting passenger cars was discussed. Several members spoke and many of the plans submitted were thought feasible and an improvement on the present mode of lighting passenger coaches. The systems of the Julien Electric Company and the Electrical Accumulator Company were highly complimented. Mr. Marden, of the Fitchburg Railroad, stated that he "believed in electric lights," and that his company is fitting up a car which is to be lighted by storage batteries furnished by the Electrical Accumulator Company. "The entire expense of fitting up the car with the batteries, lamps, wiring, etc., is only $375. Twelve lamps will be used." Gen. Elbert Wheeler, Treasurer of the Wheeler Reflector Company, of Boston, stated that with the proper kind of reflectors the same amount of light can be given with 12 incandescent lights as is ordinarily derived from 20 incandescent lamps of same candle-power.

Advices from Ansonia, Conn., report that Messrs. Wallace & Sons have, as hinted by your New York correspondent last week, sold their plant for the manufacture of carbons and the goodwill of the business to Mr. E. C. Hawks, trustee for the Carbon Manufacturers' Association, and will themselves cease the manufacture of this line of goods. It is further reported that the machinery for making carbons will be taken down and removed to either Pittsburgh or Cleveland.

The Jarvis Engineering Company, of Boston, are receiving many inquiries in regard to their new style of brick chimneys. The fact that they can be erected for 33⅓ per cent. less than the ordinary brick chimney is attracting considerable attention from steam users. They can be built either square or round and to any desired height. The inside wall or core is connected to the outside wall all the way up, but there is an air space between. The flue is gradually expanded as it rises, and it is from six to twelve inches larger at the top than the base; this expansion relieves the draft from any friction of passing smoke or gas and increases the power of the chimney 25 per cent. They are building a chimney for the Edison Illuminating Company, Brockton, Mass., that is half up, and will start two more for the Edison Company stations in Boston. They also have orders to erect one for a paper mill in Holyoke, and a woolen mill near Lawrence.

Mr. Lucius B. Wright, of Sowden, Elder & Wright, is highly esteemed in this section, not only for his being an authority on scientific subjects, but for his expertness as a marksman. Recently, Major Wright came very near achieving a hit that would have placed him on record as a peer with either Buffalo Bill or Dr. Carver as a "crack shot." Being aroused suddenly from a sound sleep by Mrs. Wright, and informed that there was an intruder on his premises, he seized his trusty rifle, and simply remarking to his wife he would just scare the supposed burglar, he took aim at a button on the man's coat, plainly discernible in the moonlight, and fired. The man with the button dropped, and Mr. Wright hastened to the spot only to find that he had come within a hair's breadth of killing a police officer who was spying around in discharge of his duties.

W. I. B.

PHILADELPHIA NOTES.

PHILADELPHIA, Pa., April 18, 1887.

The iron steamer "Olwitti," built by Cramp & Sons for Henry B. Plant, of New York, and to be used for passenger and mail service between Tampa, Fla., and Havana, has been furnished with an Edison plant of 400 lights. She is capable of 16 knots an hour, which surpasses the speed of any other Atlantic coastwise steamer. This company has sold to W. H. Wharton & Co. two dynamos within the past month which are to be used for lighting their buildings and also in experimenting with motors for street car purposes. They have also just closed a contract with the Toledo Insane Asylum for 1,750 lights with six Straight Line engines and six Edison dynamos. The United States Electric Light Company, of Washington, D. C., have closed with the Edison Company for the installation of an incandescent central station plant in connection with their arc plant; it will have a capacity of from five to ten thousand lights, with a probable increase to 20,000 lights. The Rhylon Electric Light Co., of Ashbourn, Pa., have purchased a 150-light dynamo, which, with the aid of storage batteries, lights the residences of J. B. Stetson, 150 lights; H. H. Rorlofs, 125 lights, and W. F. Forey, 100 lights; and they are talking of increasing their capacity.

The H. B. Smith Machine Company have sold the Pennsylvania Electric Light Company two Armington & Sims engines, one 80 h. p. and the other 35 h. p.

Mt. Carmel, Pa., is considering the advisability of increasing the central station plant with an additional 500-light Edison machine.

A company with a capital of $250,000 is about closing contract with the Edison Company for a large plant at Memphis, Tenn.

The Eureka Electric Company have a new arc lamp which is exclusively operated by the current, having no mechanical movements in it whatever. From operations with one lamp, they feel safe in saying that two of them can be operated to the horse-power. The lamp can be manufactured, they assert, for far less than anything heretofore invented, and will soon be placed on the market at comparatively small cost. Mr. Fitzgerald, president of the company, says that they will also soon place on the market a dynamo possessing many points of advantage at greatly reduced prices.

The Electrical Bureau has been granted permission to extend the city's underground conduits on North Broad street from Lehigh avenue to Germantown avenue and also on Filbert street near the City Hall. The Penn Electric Company are also granted the right to lay conduits on South street from Eighth to Twenty-fifth, and on Chestnut street from Second to Twenty-third. The Board of Supervisors declined to consider applications from the Morse and Edison underground conduit companies, as they had failed to comply with the general ordinance requiring detailed plans to be submitted of the streets they proposed to occupy.

The plans of the Keystone Light and Power Company were referred to Chief Walker with instructions to formulate an ordinance for presentation to councils.

D.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, April 16, 1887.

Mr. Edwards H. Goff, general manager of the American Electric Manufacturing Company of New York, was at the Grand Pacific Hotel the fore part of the week. Mr. Goff was here for the purpose of establishing in Chicago a Western department of his business. A local newspaper, however, gives Mr. Goff credit for much more far-reaching designs, and, as there may be more or less truth in the matter, I reproduce here the local paper's article:

"Mr. Goff's business here—if he succeeds in it—will be of very especial interest to the people of Chicago. It is believed to be no less than the purchase of a controlling interest in all the gas companies of the city, with a view of uniting these companies in one combination, this combination to build electric light works in connection with each gas works, and thereby control and supply all the artificial lighting of the city both by gas and electricity. Mr. Goff is understood to be acting on behalf of a syndicate of New York capitalists who are already very largely interested in two of the Chicago gas companies. The manufacturing company which Mr. Goff is the head of owns a controling interest in a dozen or more large lighting companies in different cities in the East, some of them electric lighting companies and some joint gas and electric light. Mr. Goff was called on yesterday, but refused to answer any questions relating to his possible or intended purchase of the Chicago gas stock. He neither denied nor affirmed the reporter's story of what he was here for; he simply refused to talk on that subject. He said he was here to establish a Western branch of his company in this city, as the company had decided to make Chicago its headquarters for the Western business, which is certainly true as far as it goes. In reply to some other questions he said:

"'Unquestionably within a very few years at least, all the Chicago gas companies will be united and will supply electric light as well as gas light. It will not be a monopoly to keep up prices, but a combination to reduce expenses and thereby reduce prices, and while it will pay the projectors a reasonable dividend it will be very beneficial to the city at the same time. A gas company can build a plant and supply electric light over its territory for half the expense that an independent electric lighting company can. The united gas companies of the city could put in electric lighting works in addition to their gas works and furnish the city with electric light for a little over half the price an independent electric lighting company would have to charge. The saving would be chiefly in the running expenses. For instance, if the consumption of gas were doubled, it would not follow that the cost to the company would be doubled; the total cost would be increased but a trifle. The same force of employés practically could do the work. Then again the introduction of electric lights would increase the consumption of gas. When streets are lighted with electricity there is more gas burned in the houses than was burned altogether when both streets and houses had gas only. This is a demonstrated fact. People accustomed to electric light on the streets must have good light in the house. In Portland, Me., for example, where we put in the plant with which the streets of the city are lighted, the total consumption of gas is greater than when the streets were lighted with gas. In St. Paul it is the same, I believe. Another thing, the introduction of electric lighting is invariably followed by a reduction in the price of gas. If the gas companies in this city supplied electric light also, they could light the streets of Chicago with electricity for about half what it now costs the city for gas, and give ten times better light.'"

It is understood that a Philadelphia syndicate has also been figuring on a controlling interest in the gas companies of Chicago, and that to this fact is due Mr. Goff's visit here on behalf of the New York syndicate. The New Yorkers, it is said, propose to get control if money will buy it. The anxiety of Eastern capitalists to place their money in Chicago just now is something unprecedented—they seem to be fairly tumbling over each other in their haste to invest.

Mr. Jean W. Wetmore, of the Okonite Company, favored this office with a call this week.

The papers give a description of a train of Pullman cars which have been on exhibition here in Chicago for the last few days. There has been a good deal said and written lately about the relation which electricity is to bear to railroading in the future: and it is reported that we are to have a new fast train between Chicago and New York which is to be lighted by electricity. The storage battery and electric light companies are probably keeping their eyes open with regard to this new work.

The Penn Electric Light Company, of Philadelphia, has just doubled its electric light plant, and East Livepool, O., has added 45 lights to its plant. The Western Electric system is used in both cases.

Col. S. G. Lynch, broker, 146 La Salle street, Chicago, furnishes me the following telephone stock quotations:

Bell of Mo.	$155@$157
Central Union	53@ 54
Chicago	375@ 400
Colorado	20@ 22
Cumberland	80@ 85
Great Southern	30@ 33
Michigan	72@ 73
Rocky Mountain Bell	40@ 45
Wisconsin	105@ 107

W. A. K.

CALIFORNIAN NOTES.

SAN FRANCISCO, Cal., April 9, 1887.

The telephone people have moved into their new quarters on Pine street, put up a new switch-board, and now have a very creditable exchange. I don't know much about the service in other cities, but I must say that here it is good. I have myself been a subscriber to the exchange for three years, and so far have had no complaint to make, while I have heard no complaint from anybody else.

The Brush Company is doing very well, and has an efficient plant. It keeps well posted as to the new developments in electricity.

A 100-light incandescent plant was put in recently at Wapa by Mr. H. Condit, representing the Sawyer-Man Company for this coast. It has been working splendidly, and has never given any trouble. The users tell me that they would not be without the light for any consideration. This plant is installed in a tannery, one of the hardest places in the world to light up satisfactorily. The same gentleman had also put in a number of arc plants at Eureka, Humboldt County, with satisfaction.

Mr. R. A. Simon, of the San Francisco Electric Construction Company, put in a plant recently at Amador City, Cal., to light the South Spring Hill stamp mill, compressor room, vanner room, etc. The dynamo is a 25-light machine and is driven by water-power. The wheel is connected to the armature shaft. It is 6 inches in diameter, with small copper buckets about 1¼ inches apart. Mr. Simon has also been at work setting a 50-light machine for engine house, blacksmith shop, ore house, power house, office, shaft drifts, cross-cuts, etc. When last heard from, the wires had been carried down to the 800-foot level, Clark's extra rubber-covered wire being used. This work will give a great impetus to electrical work in mines here away.

THE TELEGRAPH.

Unpaid Sunday Work.—Complaint is made that the men in the telegraph offices along the New Jersey Central Railroad are now compelled to work on Sunday without any extra compensation.

Mexican.—The earnings of the Mexican Telegraph Company the first week of April were $5,583, an increase of $1,904, and of the Central & South American Telegraph Company $9,810, an increase of $2,837.

Loss of the Cable Steamer "Volta."—The telegraph cable repairing steamer "Volta" has foundered off the island of Mycanus, in the Grecian Archipelago. A portion of her crew were lost, the captain, two officers, and 22 Lascar stokers being drowned. The remainder of the crew and passengers are believed to be safe.

More B. & M. Litigation.—Still more litigation over the affairs of the Bankers & Merchants' Telegraph Company is on foot. The latest suit is brought by Townsend Cox and Townsend Cox, Jr., who were the owners of $731,000 of the general mortgage bonds of the company previous to the foreclosure sale in July, 1885. They have sued Edward S. Stokes and the Reorganization Committee—Dwight Townsend, John Anderson, George Turnbull, and Edward Salinger—the United Lines Telegraph Company, and the Farmers' Loan and Trust Company, in

the Supreme Court, charging Mr. Stokes and the members of the Reorganization Committee with a great many improper acts, and ask for a revision of the whole existing arrangement.

Western Union Gossip.—A daily paper has the following: "Dr. Norvin Green, president of the Western Union Telegraph Company, isn't in first-rate health. Signor Morosini doesn't think he has been treated as courteously as he deserves lately by some of the officers of the Western Union Telegraph Company. George Gould and Signor Morosini no longer speak affectionately as they pass by."

Cable Rates.—Manager Ward, of the Commercial Cable Company, last night emphatically denied the report that his company was about to succumb to the cable pool. "The Commercial Cable Company," said Mr. Ward, "has no intention of yielding to the demands of the pool managers. The pool people, on the other hand, are practically hoist with their own petard, for they have been sending messages from Marseilles, say to New Orleans, for less than it costs to telegraph from New York to San Francisco. We have had no understanding with the pool managers, and there has been no adjustment of rates among us."—*New York Times.*

THE TELEPHONE.

The Massachusetts Telephone Company has been granted, by the Brockton, Mass., aldermen, permission to erect poles in that city.

Philadelphia and New Haven.—A long distance telephone connecting with Philadelphia and New Haven was set up in the New York Maritime Exchange on April 19.

Solicitor General Jenks has expressed himself as being very well pleased with the recent decision in Boston against the Bell Company. "He is confident that the ultimate decision will be in favor of the government, and hence is chiefly anxious to prevent delay on the part of the counsel for the telephone company.

The Telephone in Albany.—Mr. Uline, speaking of the latest telephone bill at Albany says: "I am not authorized to speak for other companies operating in this State, but it is to be supposed that the same reasons which, after careful consideration, have determined this company to sacrifice its property and abandon its business will influence them in like manner."

Mahoning, O.—At Youngstown, O., on April 7, suit was settled between the Central Telephone Company and the Mahoning Electric Company. It was claimed that the wires of the latter ran so closely to the telephone wires as to interfere by induction. Decree was entered providing that an electric light wire should not run closer than 150 feet to telephone wires, and that double electric wires must keep 30 feet away, except where they are erected by the cross system, when the distance shall be 12 feet. Each company is to pay its own costs.

The Telephones of St. Bernard.—The monks of St. Bernard, who devote themselves as ardently to the study of science as to the rescue of wayfaring men, have brought the telephone into their service of mercy. The famous hospice is now in telephonic communication with the Cantine de Proz and the village of St. Pierre, as also with the Cantine de Fontinte and the village of St. Chemy, on the Italian side. A further extension of the system is in progress, though the execution of it must needs be surrounded with great difficulties in that Alpine region of snow and ice.

New Jersey Southern.—A special dispatch from Trenton of April 17 says: The New Jersey Southern Telephone Company, of Woodbury, has filed articles of incorporation and received a charter. The capital stock is $250,000. The company has secured 11 counties south of and including Mercer and Middlesex counties. The charter is given under letters patent granted to Julius Emmer. The following are the officers: President, Charles W. Starr; secretary, Henry C. Loudenslager; treasurer, W. Harrison Livermore; directors, Mahlon W. Newton, James E. Highly, George H. Barker, Joseph B. Roe, John M. Henderson and T. Earl Budd; solicitor, Robert S. Clymer.

U. S. Senator Harris.—"Has Senator Harris made anything out of the telephone business?" asken one of his friends. "Not a cent. On the contrary, he has lost several thousand dollars, to say nothing of the injury to his name consequent on the disclosures in regard to the Pan-Electric affair. Harris is not half as well off as folks think he is. He has property in Memphis that may be worth a good deal some time, but he lives on his salary as Senator. He says he never was worth as much as he was in 1865, when Parson Brownlow set a price of $25,000 on his head and he fled to Mexico to save Brownlow from wasting the money on him."

Mexican.—The annual meeting of the Mexican Telephone Company was held in New York, last week, and directors were chosen as follows: John D. Sargent, S. Lawrence French, H. W. Gray and Charles Keveney, of Boston; Robert Colgate and Percy R. King, of New York, and M. L. Guiraud, of Mexico. These are all new names except Messrs. Sargent and Guiraud. The retiring directors are Messrs. E. B. Welch, A. E. Denison, J. H. Goodspeed, George W. French and William Reed, of Boston. The financial exhibit showed the various reasons for nonpayment of dividends in 1886, but better things are expected in 1887. A consolidation is being pushed of all the sub companies with the parent company.

Buenos Ayres, S. A.—A Buenos Ayres correspondent writes us: "There is a big telephone row going on in this city. The River Plate Union Telephone Company, who had about 2,000 subscribers, amalgamated recently with the Gower-Bell Company, who had about 1,800, making thus a grand total of 3,800 subscribers. After this, the monthly subscription rate was raised from $7.50 to $12. The public was naturally opposed to this, but the company did not see its way to lowering the tariff, and the consequence is that in 15 days the company have lost 2,000 subscribers, and a new co-operative company has been formed, with a capital of $200,000, which will soon begin to use their lines to cut the other company out." Quite an interesting state of affairs!

Southern Telephone Legislation.—General Barney in his circular of April 15 says: The Texas Legislature adjourned on the 4th inst.; the only legislation of importance attempted affecting telephone companies was the introduction into the Senate of a rate bill similar in its provisions to the Indiana law. The committee to which it was referred, gave a hearing to the telephone interests affected, and as a result of the convincing arguments submitted against the passage of such a law, the bill was adversely reported. In Arkansas a similar bill introduced in the house has had a more eventful experience. After being rejected the vote was reconsidered, the bill passed and sent to the Senate, where after a stubborn contest, and at its third reading, the bill was defeated by the decisive vote of 28 to 3. It is a curious fact that agents of the infringing companies operating in Arkansas (in which State they have an aggregate of probably 700 subscribers) were conspicuous by their advocacy of this attempted legislation

THE ELECTRIC LIGHT.

Stockton, Kan., will soon have an electric light plant.

Atlanta, Ga.—The Empire Electric Company, of Atlanta, will put up a plant.

Hannibal, Mo.—Carter, Shepherd & Co. propose lighting their mill by electricity.

Garnettsville, O., is to have the electric light. Mr. W. T. Udall is among those interested.

Port Jervis, N. Y.—Mr. J. H. Dimmich is prominent in the movement to light Port Jervis by electricity.

East Greenwich, R. I.—The Phœnix Woolen Company intend to put electric lights throughout their mill at East Greenwich.

Austin, Tex.—The board of managers of the Deaf and Dumb Asylum have contracted for an Edison plant for the buildings and grounds.

Georgetown, Cal.—The Georgetown Electric Company has been incorporated by J. E. Tucker and others, with a capital stock of $7,500.

Mexico, Mo.—The Mexico Electric Light & Power Company has been formed by J. F. Llewellyn and others, with a capital stock of $10,000.

Idaho Territory.—The Idaho Electric Supply Company, Hailey, I. T., has been formed; Mr. T. Argee, president. The capital stock is $20,000.

McPherson, Kan.—It is stated that the Thomson-Houston plant will begin with 30 arcs of 2,000 candle-power, and 400 16 candle-power incandescents.

The Hawkeye Electric Manufacturing Company of Oskaloosa, Ia., has been formed with a capital of $500,000. The president is Mr. C. P. Searle.

Ticonderoga, N. Y.—The Ticonderoga Electric Light and Power Company has been incorporated by G. S. Clark and others, with a capital stock of $16,000.

Sheffield, Ala.—The Westinghouse alternating system has been contracted for by the Sheffield Land, Iron and Coal Company, and will be put in at once.

Boise City, I. T.—The Capital Electric Light, Motor and Gas Company, of Boise City, has been incorporated by W. H. Nye and others with a capital stock of $10,000.

Cortland, N. Y.—The Peekskill Electric Light and Power Company has been incorporated at Cortland, by G. B. V. Frost and others, with a capital stock of $30,000.

Aurora, Ill.—Mention has already been made of the Gogebic Electric Light Company. It has now been formed by J. H. Pease and others, with a capital stock of $30,000.

Newton, Ia.—The Thomson-Houston Electric Light and Power Company of Newton has incorporated, with a capital stock of $25,000. Mr. H. M. Vaughan is president of the company.

Primary Battery Car Lighting.—Mr. Pennock, of the Pennock Underground Conduit and Surface Telegraph Company, has a primary battery with which he proposes to do car lighting.

San Diego, Cal.—The St. James Hotel has contracted for a 500-light Edison plant to be put in at once. The new hotel at Cornado Beach is to have a plant of 1,000 incandescents and 30 arcs.

New York City Bids.—The Gas Commission rejected last week all the bids of electric light companies on the ground that they were too high, and decided to advertise for new bids, to be received on April 26.

Dover, N. Y., has, it is stated, refused the petition for the erection and operation of a Thomson-Houston plant in that city. Dover had better remove to Central Asia on May 1.

Lights Overhead.—Military experiments have been making at Metz, Germany, with electric lighting from a balloon. The experiments have attracted much attention and are reported successful. The balloon is propelled by an electric motor.

Tonawanda, N. Y.—Mr. E. F. Wilson, of B. F. Wilson & Son, engine builders, has a new dynamo for which very good results are claimed. The Wilson Electric Light Company has been formed, and lights are to be put in operation immediately.

The Mutual Accumulator Company has been formed in Brooklyn for the purpose of lighting, etc., by means of secondary batteries. The company will use the Julien battery. Its Brooklyn headquarters, as well as those of the Mutual Electric Company, will be at 292 Graham street.

In the Stampede Tunnel.—The work on the big Stampede Tunnel, through the Cascade Mountains, W. T., is being pushed with the help of electric lights, of which there are 25 in each end. The cost is only 6 cents per day per light, it is said, the machinery used in working the drills furnishing the power also.

Waterhouse Light for New York.—An application was received from the Waterhouse Company by the Aldermen on April 19 for permission to place wires in the streets for the purpose of competing with other electric illuminating companies. The application was referred to the Law Committee.

Simcoe, Can.—The town of Simcoe, Ontario, has just contracted with the Loomis Electric Manufacturing Company, of Boston, Mass., for fifty of its arc lamps for lighting the streets of that town. H. B. Brown & Co., of the same place, have also engaged an incandescent plant of the Loomis system for their mill.

Dexter, Me.—Dexter is to be lit by electricity. Some $5,000 is already pledged in the stock and parties are ready to put in the work, and take what stock the citizens do not want. It is understood that Amos Abbott & Co. will use the electric lights in their factory, and probably the other mills will eventually follow suit.

The First Train Lit by Electricity.—It is now claimed that the first train it wholly by electricity was run on the Connecticut River Railroad, beating by one day the like experiment on the Boston & Albany. The Barrett apparatus, charging from the train itself, is used on the Connecticut River road, as already described in these columns.

Alameda, Cal., is one of the best lighted towns in the State. The plant was put in by the Indianapolis Jenney Company. There are nine towers 125 feet high, four 100 feet, and five cranes. Each tower carries five lights. Mr. G. R. Langston, who has been superintendent, leaves for Southern California, where he will manage a large light and power station to be operated by water-power.

Reciprocity in Brookline.—The Brookline (Mass.) Gas Company supplies the Suburban Electric Light Company of the same town with coke and coke screenings for fuel. It will have two boilers set with the Jarvis boiler setting to burn this class of fuel. The coke is thoroughly wet before it is fired, and the gas distilled from burning the wet fuel is utilized by the hot air discharged over the fire through the air ducts of the Jarvis furnace.

British Columbia.—Messrs. McMullen & Mitchell, of Victoria, B. C., who were the first contractors for central electric stations in the Dominion, are in this city, and have closed contracts with Mr. Lawson for central station plants for Vancouver, B. C., and Brandon, Man., the former for 800 lights and the latter for 500, on the Edison system. The first station was for Victoria, B. C., where 400 lights are now in operation.—*Montreal Gazette.*

Brooklyn, L. I.—The Bacon Legislative Investigation Committee has been probing electric light matters. Fire Chief Nevins and Under-sheriff McLaughlin gave evidence as to their position as officers and shareholders in the Citizens' Electric Light Company. Mr. Cooper, president of the company, has also been on the witness stand. President Lynch, of the New York United States Company, gave evidence as to the unsuccessful efforts he had made to get a hearing in Brooklyn and to supply electric lights there to the city.

The Nashua (N. H.) Electric Light & Power Company have voted to increase the capacity of their station. They have made a contract with the Jarvis Engineering Company, of Boston, for a new boiler to be set with the Jarvis boiler setting, also two more Armington & Sims engines. These engines will be connected with a shaft with pulleys in the middle; either engine can do the work if by any accident one engine should be disabled. This is one of the most economically run stations in the country. Screenings and soft coal are used for fuel.

APPLICATIONS OF POWER.

Oswego, N. Y., talks electric motors for street cars.

Harrisburg, Pa.—An electric railway is projected for the city.

Biddeford, Me.—The Biddeford & Saco Horse Railroad is to be run by horses, cables, or electric motors.

Fort Smith, Ark.—A new street railroad company has been formed, and it is proposed to use electricity as motive power.

Jacksonville, Fla.—It is reported that the Springfield Company will introduce an electric motor on their street railway line.

Binghamton, N. Y.—Preparations are now being actively made by the Washington Street, State Asylum and Park Street Railway to equip with the Van Depoele system.

Ventilating Offices.—Mr. John C. Paige, the insurance agent, Boston, is ventilating his offices with a Sturtevant exhaust fan driven by a Sprague motor. It "works like a charm."

Pittsburgh, Pa.—The Detroit Electrical Works are busy on their contract for an electric railway at Pittsburgh. It will be about a mile in length, and will start with an equipment of two cars.

Electric Railways in Mines.—The Union Electric Railway Company, of Philadelphia, operating the Schlesinger system, has contracted to build an electric railway in a mine, the motor to haul from 15 to 20 loaded cars.

Allegheny City, Pa.—The Bentley-Knight Electric Railway Company has been awarded a contract for the construction of an electric railway for the Observatory Hill Passenger Railway Company, Allegheny City. The road will probably be finished by the end of July. It will have both conduit and overhead conductor, will run some three miles, and includes a 10 per cent. grade.

St. Joseph, Mo.—A. Steinacher, Henry King and Theodore Steinacher, principal owners of the Union Street Railroad, went to New York and other cities for the purpose of buying electric motors for their line. After inspecting the various systems of electric railways, as found in operation in all the principal cities where the electric motor is used in propelling street cars, they contracted with the Sprague Electric Railway and Motor Company for electrical equipments for the Union road, together with all the latest appliances. The company expect to surpass results reached by any of the electric roads so far built, including the lighting of cars by electricity; and they also expect to run their cars at the rate of from ten to twelve miles per hour.—*Street Railway Gazette.*

An Underground Railway Scheme.—At the last session of the Rapid Transit Commission in this city, Mr. Rowland R. Hazard, of the New York Underground Railway Construction Company, presented an elaborate scheme, which includes four routes of so-called "superficial subway" railroad, and one "marginal freight line" of elevated road. The scheme contemplates the building of all passenger lines, except ferry connecting lines, on the subway system. This is made possible by improvements

recently made in the mode of building cars, and by the use of noiseless partitions, electric motors, and by a new system of ventilation. The cars, which are to be of steel, run on wheels placed at the ends, thus allowing the body of the car to come within a few inches of the ground. The saving of space thus obtained makes it unnecessary to have the subways over 9½ feet in depth, doing away with the great objection to underground roads, the encroachment upon the sewerage, gas and steam registers. The commission voted that the time for receiving plans of routes be limited to April 30.

PERSONALS.

Mr. Andrew Carnegie, once a telegraph messenger, under Mr. J. D. Ried, next an operator, and now millionaire ironmaster, is about to marry a Miss Whitfield in this city. All operators will wish Mr. Carnegie full years of married happiness. He is a noble specimen of the self-made man, is in sympathy with labor, and uses his wealth with lavish but discreet generosity.

Mr. John G. Moore, the financier and broker, is a member of the Union League, New York and Lotus clubs. He was formerly president of the Mutual Union Telegraph Company, and made about a million, it is understood, by its sale to the Western Union. He was also formerly identified with other telegraph interests. He is a director in the Western Union, Richmond & Danville, Richmond & West Point Terminal, East Tennessee, Virginia & Georgia, Memphis & Charleston and New York & New England. He is not yet forty years of age, has been in New York twenty years, and came from Maine. He is quiet and unobtrusive, seeking no display. He is one of a number of men who are engaged in developing the enormous resources of the South through the improvement of its railway system.

Mr. Frank T. Brown has been appointed to fill the vacancy in the examining corps of the United States Patent Office, caused by the resignation of Mr. Charles J. Kintner, and has already entered upon his duties. Mr. Brown has been connected with the Patent Office for about twelve years. During that time his record has been uniformly creditable to him as an upright and able examiner. He was appointed in November, 1875, at a salary of $720, and assigned to duty as an acting assistant examiner in the class of "Household." As the result of successive competitive examinations, he was promoted in July, 1877, September, 1878, and October, 1881, to the grades of second and first assistant examiner, respectively. In 1881, Mr. Brown served as examiner of interferences and during the administration of Commissioner Butterworth bore the title and performed the dutics of law clerk. His appointment as principal examiner dates from July, 1884, ince which time he has been in charge of the class of "Hydraucs."

Mr. Charles Walker Morse died at his residence in Saybrook, Conn., of internal cancer, on April 16. He was the eldest son of Prof. Samuel F. B. Morse. In his early life he shared his father's labors in the struggles of the electric telegraph, and also rendered experimental assistance to Col. Colt, of revolver fame, who was a frequent visitor of Prof. Morse during his telegraphic experiments. In 1857 he rendered valuable services to the government in the protection of its property on the upper Minnesota River during the trouble with the Sioux Indians at the Spirit Lake massacre. Mr. Morse was a man of many accomplishments, being a fine penman, an excellent draughtsman, an artist and the patentee of several inventions. In 1883 he had the decoration of the "Bust of the Liberator" conferred upon him by the Venezuelan Government in recognition of valuable services and suggestions in the establishment of the Morse system of telegraphy in that country. He leaves a wife and three children.

BUSINESS NOTICES.

Correction.—In the advertisement of James McLain, which appeared on page ix. of last week's issue, the number of pounds of steam per horse-power per hour should have been, according to copy, 64 instead of 34.

Jordan & Gottfried, 208 Canal St., N. Y., carry a complete stock of iron and brass machine and wood screws, bolts, cap and set screws, taps, dies, files, twist drills, brass and rubber in tubing, rod and sheet copper, brass, German silver, steel and iron wire, shafting, tools, etc.

Root Boilers.—The Abendroth & Root Manufacturing Company, No 28 Cliff street, New York, are meeting with great success in the sale of the Root sectional safety boiler. Mr. A. S. Fiske, their agent at Cincinnati, Ohio, has just reported a contract for two 150 horse-power each, for the Brush Electric Light Company at Louisville, Ky., and another of the same size is ordered for the Edison Electric Light Company at Detroit, Mich.

Messrs. J. & E. Barbour, No. 9 Liberty street, Portland, Me., have taken the agency of the Jarvis Engineering Company for Maine. They will handle all the goods of this concern, including setting boilers with the Jarvis furnace, Armington & Sims Co. engines, Korting injector and National feed water heater. Mr. J. N. Pratt, former agent, has been assigned to the New York office of the Jarvis Company, No. 109 Liberty street, this city.

For Cleaning and Polishing Arc-Light Globes and Incandescent Shades Nothing Equals "Silk Sponge Pads."—This novel and handy cleanser and polisher is made of silk waste. It removes grease, dirt or stains from glass and other smooth surfaces quickly, economically and effectively. By the highly-polished condition of electric light globes or shades, resulting from the use of the "SILK SPONGE PAD," the full benefit of the light is obtained. Several electric light companies now use the pad. The price is $4.50 per dozen, and may be obtained from all electrical supply dealers, or of George S. Brown, 2,290 Washington street, Boston, Mass.

MISCELLANEOUS NOTES

In Milling Processes.—A German inventor is now at work on an electric "middlings" purifier.

Underground Affairs in New York.—Mayor Hewitt is still dissatisfied with the new Underground Bill, and wishes the Controller and the Commissioner of Public Works added to the commission as well as himself.

Fire-Alarms.—The Massachusetts Auxiliary Fire-Alarm Company has been organized at Portland, Me., with a capital stock of $250,000. Mr. T. Leavitt, Everett, Mass., is the president, and Mr. G. W. Daniels, treasurer.

Stokes Not Interested.—Evidence is still being taken in the McMahon-Flynn suit. The latest facts brought out relate to the efforts made to get Mr. E. S. Stokes, of the United Lines, interested in the subways and the Dorsett system, and the failure of Mr. Flynn to secure his support.

Putting On a Cover.—Our esteemed and excellent London contemporary, the *Electrician*, has donned a tasteful cover of orange, greatly improving its appearance. The last issue to hand, too, contains a fine steel plate portrait of Mr. W. H. Preece, chief electrician of the English Postal Telegraphs. As Mr. Preece has not been this way lately, it is pleasant to have this reminder of him.

Put Under Bond.—Judge Shipman, on April 18, in the United States District Court, directed that William McMahon, the plaintiff in the McMahon-Flynn subway suit, file a bond of $600 to guarantee the payment of costs in the hearing in equity in the suit now going on before Commissioner Shields. The order was granted on the application of Louis Adler, counsel for the Consolidated Telegrah and Electric Subway Company, a party to the defense.

An Electric Air Brake.—An extended test of various styles and patents of railroad brakes will be made at Chicago in May next, under the auspices of the Chicago, Burlington & Quincy Railroad. There will be but one system of buffer brakes exhibited, but Card, Carpenter, Eames, Park and Westinghouse, all well-known patentees, will exhibit systems wherein compressed air or vacuum furnishes the force for braking, but a simultaneous application is secured by electricity. The latter is a desideratum long sought for, and is especially desirable in cases of braking freight trains. H. D. Garrett, master mechanic of the Pennsylvania Railroad at the West Philadelphia shops of that road, says his company is at present much interested in a series of experiments with brakes in which electricity plays an important part. These experiments are being made at Altoona, and the results have not been made public as yet.

STOCK QUOTATIONS.

The following list, compiled by Mr. W. H. Baker, member New York Stock Exchange, 16 and 18 Broad street, gives the current quotations of electrical stocks :

April 19, 1887.

TELEGRAPH.	Bid.	Asked.
Am. Dist.....	25	40
Am. Tel. & Cable	76¼	78
Cen. & So. Am..	96	100
*Com. Tel	.....	.....
*Gold & Stock...	.....	.....
*Inter. Ocean Tel.		.....
N. Y. Mutual....	78	80
Pac. & Atl.....	48	54
*Postal T. & C...	.....	.....
South. & Atl...	63	75
W. U. Tel.....	76¼	76⅝
W. U. Scrip.. ..	73	.....
W. U. Bonds.....	119	.....
Mut. U. Bonds ..	88¼	88¾
TELEPHONE.		
Am. Bell	219¼	220
Am. Speaking ..	110	120
Erie.....	27¾	28¼
*Hudson River..	.....	58½

TELEPHONE.	Bid.	Asked.
Mexican.....	1⅝	1⅝
*N. Y. & N. J...	88	93
N. Y. & Pa.	.....	.....
New England....	43½	44½
*Southern Bell..	120	130
ELECTRIC LIGHT.		
*Am. Electric...	50	55
*Brush.....	50	85
*Brush Ill.....	100	110
*Consolidated....	.....	.....
*Daft...	.....	.....
*Edison.....	230	234
*Edison Ill.....	95	105
*Edison Isolated.		.....
*United States...	40	.....
*U. S. Ill.....	90	95
MOTOR.		
*Daft.....	.....	.....
*Sprague.....	.....	.....

* These stocks are so seldom dealt in that it is difficult to give prices at which they can be bought or sold. The figures given are as near as can be ascertained.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

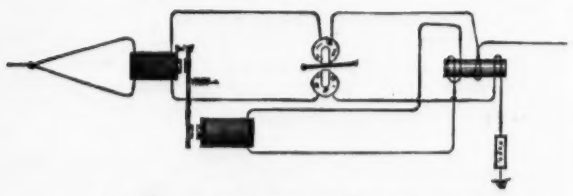
PATENTS DATED APRIL 5, 1887.

360,425. Hello-Telegraph; J. P. Finley and J. D. Smith, Washington, D. C. Application filed Jan. 13, 1886. Peculiar signaling and recording devices are mounted on a suitable support.

360,429. Electro-Cautery Instrument for use in Surgery; D. H. Goodwillie, of New York, N. Y. Application filed Aug. 13, 1886. Structural details enabling convenient handling of the device.

(1) 360,447. Electric Annunciator; (2) 360,448 Electric Annunciator; J. C. Kunkle, of Hoboken, N. J. Applications filed respectively Aug. 13, 1886 and Nov. 19, 1886. These inventions relate to improvements in the means for dropping the shutters, and the latter invention embraces more particularly a double annunciator; that is, one which may be read from either side of the case. Both faces are alike. See illustration.

360,492. System of Electrical Distribution; F. Van Rysselberghe, Schaerbeek, Belgium. Application filed June 8,



360,528. QUADRUPLEX TELEGRAPHY.

1886. The object is to distribute equal currents to a great number of lines of greatly different resistances from a single system of generators or from a single generator.

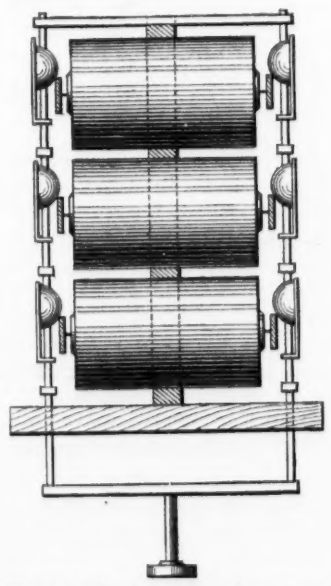
360,528. Quadruplex Telegraph; F. W. Jones, of New York, N. Y. Application filed Jan. 5, 1887. This is a device for preventing false signals in the receiving apparatus of a duplex or quadruplex telegraph, when, through reversal of the line current to affect a polar relay, the neutral relay which is at the same time receiving a signal may momentarily lose its power, so as to allow its armature lever to fall back and make a false movement. See illustration.

360,532. Connection for Carbon Elements in Galvanic Batteries; W. P. Kookogey, of New York, N. Y. Application filed April 24, 1886. This connection consists of a lead head cast at the top of the carbon. It is provided with a brass core, which is drilled to receive the binding screw.

360,538. Electric Lighting System; J. A. Powers, Lansingburg, N. Y. Application filed Jan. 18, 1887. This is a cut-out arranged to be brought into operation by the removal of all the lamps in the group, and a restoring device adapted to be brought into operation by the closing of one or more of the lamp circuits when the group is short circuited. See page ,188 this issue.

360,567. Insulating and Protecting Electric Cables; T. H. Dunham, of Boston, Mass. Application filed Sept. 29, 1886. The wires are covered with untwisted raw cotton or silk and oakum which is saturated with rosin, pitch and tar.

360,626. Telephone Receiver; J. H. Tabony, of New Or-



360,447. ELECTRIC ANNUNCIATOR.

leans, La. Application filed Jan. 31, 1887. This invention is based upon and is an improvement on the Reis receiver.

360,570. Electric Instrument Protector; J. H. Farnham, of Walden, Assignor to the New England Telephone and Telegraph Company, of Boston, Mass. Application filed Jan. 20, 1886. This is a device for protecting electrical instruments from damage caused by the circuits coming in contact with wires carrying a heavy current. When the coil becomes hot it softens a ball of sealing wax pressed against it by a spring, which latter then moves forward and makes a contact so as to cut the magnet coil out of circuit. See illustration.

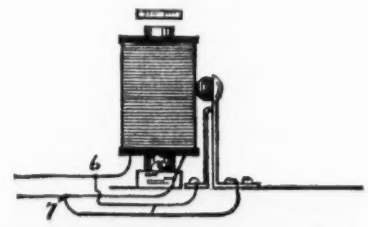
360,638. Railway Electric Signaling Apparatus; G. Westinghouse, Jr., of Pittsburgh, Pa. Application filed Aug. 25, 1886. This relates to the "closed circuit rail-system," and its object is to obviate risk of collision due to a train following too closely another in advance.

360,660. Electric House Bell; C. G. Coleman, of St. John's, Newfoundland. Application filed June 26, 1886. This is an invention for converting the ordinary house bells into electric bells in such a way as to utilize the ordinary pulls, etc.

360,662. Electric Arc Lamp; C. F. Crooke, of Buckingham Works, County of York, England. Application filed March 9, 1886. This relates to the construction of the regulating devices of lamps.

360,672. Connection-Hanger for Electrotyping Apparatus; O. S. Fertig, New York, N. Y. Application filed Oct. 20, 1886. A novel construction of hook for supporting articles in the electrotyping tank.

360,696. Electric Gas-Burner; C. W. Holtzer, Brookline,



360,570. ELECTRIC INSTRUMENT PROTECTOR.

Mass. Application filed Jan. 11, 1887. An improvement in the details of construction of electric gas-igniter for burners.

360,773. Vapor Bath; E. Hosford, of Oakland, Cal. Application filed March 1, 1884. The objects of this invention are to construct a housing or casing which is to be fitted with the proper appliances for successfully administering vapor, medicated or electric baths.

(1) 360,823. Electric Thermostat or Fire-Alarm; (2) 360,824. Automatic Fire-Alarm System; W. F. Singer Carthage, Assignor of one-half to H. C. Anthony, of Watertown, N. Y. Application filed July 26, 1886. (1) Details of construction to increase efficiency of operation. (2) This is designed as an improvement on the present system of thermostatic fire-alarm.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patent issued since 1866—can be had from this office for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, New York.